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# THE FLOWERING PLANTS AND FERNS OF THE MESTERS VIG DISTRICT, NORTHEAST GREENLAND

BY

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WITH 1 PLATE

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**Abstract.**

The following description of the vascular flora of the Mesters Vig district, Kong Oscars Fjord, Northeast Greenland, is based mainly upon collections made in the summers of 1956 to 1958 inclusive, and 1960. It includes 154 species, and covers a land area of about 110 square kilometers. The flora is written with primary attention to the local behavior of the species in relation to habitat, to lifeform, and to geographic distribution. An attempt is made to rate each species in terms of its capacity to live at various levels on each of three habitat gradients: moisture, degree of coverage of the ground by vascular plants, and physical disturbance of the soil. Judgments are made on a presence or absence basis. Observations on the habitat preferences of each species made by earlier students of the Northeast Greenland flora are summarized and compared with those made at Mesters Vig. RAUNKIÆR's Life-form classification is used. The world distribution of each species is summarized, and also its general distribution in the Greenland coastal areas.

# CONTENTS

# INTRODUCTION

## Source materials.

The material basis for the following treatment of the vascular flora of the Mesters Vig district is mainly in collections made during the field seasons of 1956 to 1958, inclusive, and 1960. Although every effort was made to gather representative material of all species that were seen, no large collections of duplicates were made. The entire collection totals 712 field numbers. The only other material used in the construction of the following list was seen in the Museum of Natural History of Iceland. It was a collection gathered by Dr. FINNUR GUDMUNDSSON and Mr. HÁLFDÁN BJÖRNSSON in June and July 1955. These men were members of a Reykjavik Museum Expedition to Mesters Vig (bay), and most of their collections came from the Blyryggen slope above Ekspeditionshus on the westerly shore of that bay.

The area covered by the flora is a small one, and is concentrated upon the vicinity of the rather intensive studies of geomorphic processes carried on concurrently by Dr. A. L. WASHBURN (see Plate I). It extends along the shore of Kong Oscars Fjord from the northwestern side of the Nyhavn peninsula, southeasterly to Mesters Vig (bay). Inland it reaches to varying altitudes on the mountain slopes (to the summit of Hesteskoen) and up the valley of Tunnelelv approximately to the junction of the latter with Gefionelv. In all it covers about 110 square kilometers. There are 154 species or lesser taxa in the following list of vascular plants known to occur in the Mesters Vig district.

## Nomenclature.

The names used in the list are in general those approved under the International Rules of Botanical Nomenclature. Where a choice has been possible, those used have in most cases been the ones found in the more recent critical studies of the Greenland flora such as BÖCHER, HOLMEN and JAKOBSEN's "Grønlands Flora" (1957), and JØRGENSEN, SØRENSEN and WESTERGAARD's "The Flowering Plants of Greenland, etc." (1958). Only enough synonymy has been included to make the list referable to the geographic and taxonomic literature cited in the text.

## Notes on habitat.

The habitat notes for the Mesters Vig flora were made in two ways. The least numerous and significant were those from collection localities. More important were observations made in approximately 180 specific study areas where the sites were examined in greater or less detail, and notes were made on the species present. From these field data, habitat notes on the species are given in terms of three gradients or gradient complexes: coverage, moisture, and physical disturbance.

Coverage, expressed in percent, means the fraction of the ground surface actually covered by living plants when viewed from above. Unless otherwise indicated, it refers only to vascular plants. It says nothing about the numbers or kinds of plants involved. The method used for its measurement will be discussed further in another paper. It was measured or estimated in all of the sites that were studied in detail.

Fifty-seven of the 180 study sites were selected as being fairly representative of all of them. These 57 were then subjected to analysis in the following manner. Further discussion of these analyses and their probable significance will be found in a later paper, but the method will be outlined here to show the source of data for the habitat notes given in the Flora.

Each of the 57 sites was first described in terms of its slope and soil materials, and then as to its snow cover, water, and temperature regimes by months from May through October. Each site was then examined for the presence of currently active geomorphic processes that might limit the growth of plants. This analysis was also made by months, May to October, inclusive. Each geomorphic process, as well as water supply, snow cover and temperature was measured or estimated on a simple gradient of rather arbitrary values. These gradients were used uniformly throughout the analysis of all the sites. Thus it becomes possible, in describing the habitat of a species noted as growing in any of the 57 analyzed sites, to give fair estimates of the moisture, temperature and snow cover conditions under which it is living, and the kinds and intensities of physical disturbances it survives. Because the 57 are reasonably representative of the remaining 123 study sites, the analyses may be applied to the latter also if this is done judiciously.

## Comparisons with earlier studies.

The habitat data given in the present Flora are highly generalized summaries derived from the field observations and analyses noted above. Even though much information is involved, the nature of the flora is such that new facts about the behavior of the species are certain to

appear with further study. To test this in some measure the habitat notes made for the same species in Northeast Greenland by others were studied and compared to those made at Mesters Vig. The most important of these earlier notes were written by SØRENSEN (1933, 1937), GELTING (1934, 1937) and OOSTING (1948). It has been tempting to take advantage also of the excellent ecological information on many species in Peary Land published by HOLMEN (1957). However, I have thought it better to keep the comparative studies confined to a smaller area, which is possible because most of the notes published in the 1930's were based on localities between lat. 71°30′ and lat. 79°00′.

In making these comparisons certain geographic terms have been used which should be explained. The term "fjord region" as used here refers to that part of the fjord region of Northeast Greenland extending northward from just south of the entrance to Kong Oscars Fjord (about lat. 71°30′) to about lat. 79°00′. Within this region I have used, for convenience, three geographic divisions: a "southern part," a "central part," and a "northern part." These divisions correspond to the three principal works referred to throughout the text. SØRENSEN's first publication (1933) was on the southern part (lat. 71°00′ to 73°30′). GELTING's (1934) was on the central part (lat. 73°15′ to lat. 76°20′). The floristic studies of SEIDENFADEN and SØRENSEN in 1937 covered the northern part (lat. 74°30′ to lat. 79°00′), while SØRENSEN's ecological notes published at the same time also covered the northern part but were expanded to include all or most of the fjord region. It is obvious that the three divisions are arbitrary and not sharply defined. There was some overlap among the original field studies and in the publications resulting from them. OOSTING's collections and notes (1948, p. 228–9) were made at widely scattered localities throughout the southern and central parts of the region, from lat. 72°09′ to lat. 74°39′.

A somewhat more natural geographic division was made by the Danish botanists working in the region. It is based on the behavior of the plants with relation to the coast line. Certain species have their main development along the outer coast, others in the inner fjords, and a third group in a "middle district" (cf. SØRENSEN, 1945). Maps of the three divisions were published for the southern and central parts of the region in the papers dealing with these parts (see above), and were republished on a single map by OOSTING (1948, p. 227). I have continued the use of these "longitudinal" divisions in the comparative studies which follow.

In most cases the behavior of the plants with respect to the moisture and coverage gradients, though it could be elaborated from the Mesters Vig data, had already been suggested by one or another, or by all of the earlier observers. Many of SØRENSEN's notes, and a few of GELTING's and OOSTING's, also suggested the relationships of species to certain of

the disturbance gradients, notably frost heaving, deflation of soil by wind, and flooding by streams. Some species that were found infrequently at Mesters Vig, and appeared to have rather narrow ranges of tolerance on the gradients, were noted by SØRENSEN and GELTING as having much wider ranges. And vice versa, other species given narrow ranges by the latter authors were found to spread widely on the gradients at Mesters Vig. It is impossible to say whether these differences are due to local racial variations in the species, or to regional variations in habitat, or merely to differing intensities of study and observation. Considering the remoteness of the region, and the difficulties attendant upon research in it, one strongly suspects the last.

The most comprehensive study of species habitats in Northeast Greenland was made by SØRENSEN (1937) in his arrangement of the vegetation into ecosystems. The basic sequence of these ecosystems was on a moisture gradient, with three major subdivisions: dry, moderately moist, and moist to wet. He listed the species and gave their distribution, on a presence or absence basis, throughout the ecosystems (l. c., p. 112–115, 134–138). From his descriptions of the ecosystems (p. 116–138) it is possible to estimate the vegetative coverages in which he found the species, and from the above-mentioned list his estimate of their spread on the moisture gradient is readily seen. His notes on the disturbance gradient, however, require some reinterpretation. He grouped all kinds of soil disturbance due to frost action and mass-wasting under a single term: "solifluction." He then applied solifluction as a major habitat factor to seven of his 21 ecosystems (l. c., p. 110). Certain of these, such as "(active) Polygon Fields" and "Solifluction clay (morasses)" have much disturbed surficial soils, as indicated by his descriptions and by studies of similar sites at Mesters Vig. Others, such as "Earth glaciers and sliding slopes", "Water-soaked ground," and possibly also "Constantly irrigated fields," have surficial soils that are essentially stable for considerable periods though they may at the same time be moving en masse downslope. SØRENSEN also thought there was slight solifluction in one of his dry ecosystems: "Clayey flats and raised beaches," but studies of similar sites at Mesters Vig showed almost no disturbance of this nature.

It will be noted that a gradient for snow cover is omitted from the habitat notes made at Mesters Vig, and in the comparisons between these notes and those made elsewhere in the fjord region. Snow cover is a major factor applied by both GELTING and SØRENSEN throughout their observations. Descriptions of the areas in which they worked suggest that in many places it is highly significant because of high winds in winter which blow all or most of the snow off the surface of the ground, and give rise to large differentials in the depth of snow on the ground.

The Mesters Vig district appears to be somewhat unique with respect to snow cover. The snow accumulates there without excessive blowing and drifting, so that the whole landscape is completely covered in the autumn, and remains so throughout the winter. The cover may reach depths of one to three meters. Only a few windward slopes high in the mountains are usually blown clear. The result of this continuous cover is the near elimination of most of the differentials that could be significant in a snow cover gradient.

## Life-form and geographic distribution.

Information on life-forms has been taken, in the main, from GELTING's work (1934). For species not mentioned by GELTING it came mostly from BÖCHER (1938). It has been included not so much for the study of life-form spectra as for a ready and rather uniform corroboration of our own field data on the general structure of root systems.

Notes on the geographic distribution of the Mesters Vig plants have been assembled from several sources which are cited in the text and need not be mentioned in detail here. Needless to say, there are many unsolved problems connected with the world ranges of these plants. Their solution will depend upon further exploration and upon much careful study of taxonomic relationships among closely related species and subspecies.

## Abbreviations used in the text.

In the interest of brevity I have used abbreviations for certain books that are referred to repeatedly in the text. Reference should be made to the list of literature at the close of this paper for details of the citations. The abbreviations are as follows:

Amph. Pl. The amphi-Atlantic plants and their phytogeographic connections, by ERIC HULTÉN (1958).

BHJ. Grønlands Flora, by BÖCHER, HOLMEN & JAKOBSEN (1957).

Circ. Fl. Circumpolar arctic flora, by N. POLUNIN (1959).

Circ. Pl. The circumpolar plants, I: vascular cryptogams, conifers, monocotyledons, by ERIC HULTÉN (1962).

Fl. Al. Flora of Alaska and Yukon, by ERIC HULTÉN (1941–50).

Fl. Icel. The Pteridophyta and Spermatophyta of Iceland, by JOHS. GRÖNTVED (1942).

Ill. Fl. Illustrated flora of the Canadian Arctic Archipelago, by A. E. PORSILD (1957).

JSW. The flowering plants of Greenland, a taxonomical and cytological survey, by JØRGENSEN, SØRENSEN & WESTERGAARD (1958).

The abbreviation "Herb. H. R." refers to the Herbarium of the Museum of Natural History of Iceland, at Reykjavik.

## Distribution of specimens.

The collections made at Mesters Vig, though small, will make two fairly complete sets. The first set, containing most of the unicates, will be found in the Herbarium of Harvard University at Cambridge, Massachusetts, and the first set of duplicates will be in the Herbarium of the Botanical Museum at Copenhagen. Further duplicates will be sent to the Herbarium of the National Museum of Canada at Ottawa.

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### *Equisetum arvense* L.

Occasional to common in habitats ranging from moist to wet. Not found in the driest sites such as excessively drained gravels and sands, but occasional in the shallow water of small ponds. It occurs in a wide range of vascular plant coverages, from as low as 1 % or less to as high as 80–90 %. It grows in the disturbed surface soils of active sorted nets and small silt gelifluction lobes as well as in the relatively stable surfaces of wet meadows and heath tundra. Forma *campestre* (C. F. SCHULTZ) KLINGE, in which sporophylls occur on the summits of branched green stems, is occasionally found.

Earlier descriptions of the habitat of this species in Northeast Greenland are in general agreement with the above. SØRENSEN (1933, p. 18) in the southern districts found it in damp soil especially near running water, but he also noted it in bogs. GELTING saw it in bogs and meadows in the central districts (1934, p. 27–8), as did also OOSTING (1948, p. 253). SØRENSEN (1937, p. 112) listed it in four of his ecosystems in the northern district, all in the "moist to wet" series: Earth glaciers and sliding slopes, Solifluction clay, Water-soaked ground, and Fresh alluvial flats. His descriptions of these sites indicate that he saw much the same range of tolerance in *Equisetum arvense* on the coverage and disturbance gradients that was evident at Mesters Vig.

Geophyte with horizontal, non-tuberous, branching rhizome and adventitious roots (GELTING, l. c., p. 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 19; HULTÉN, Circ. Pl., p. 106, map 98; POLUNIN, Circ. Fl., p. 1). In Greenland it is widespread in all the coastal districts (BHJ., p. 41; PORSILD, l. c., map 6).

### *Equisetum variegatum* SCHLEICH.

Most abundant in wet meadows or on low moss hummocks in the Mesters Vig district, though it grows over a wide range of the moisture gradient from slightly damp sandy soils to saturated meadows. It occupies a wide range also in the coverage gradient, from 1 % to 81–90 %. Although it appears occasionally on the surfaces and fronts of small

silt gelifluction lobes, its range on the disturbance gradient does not appear to be so great as that of *E. arvense*, and it was not seen on the more disturbed sites.

Found in bogs and meadows by GELTING (1934, p. 28), and in similar habitats as well as on the shores of lakes by SØRENSEN (1933, p. 19). The latter placed it in three of his moist to wet ecosystems (1937, p. 112): Earth glaciers and sliding slopes, Solifluction clay, and Fresh alluvial flats. These suggest ranges on the moisture and coverage gradients similar to those at Mesters Vig, but a somewhat greater range of tolerance on the disturbance gradient because the species was not seen in Mesters Vig soils that are the equivalent of SØRENSEN's "solifluction clay."

Hemicryptophyte with branched, horizontal rhizome and adventitious roots (GELTING, 1934, p. 293).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 19; HULTÉN, Circ. Pl., p. 52, map 45; POLUNIN, Circ. Fl., p. 2). In Greenland it is widespread on all the coasts (BHJ., p. 42; PORSILD, Ill. Fl., map 8).

### *Lycopodium Selago* L.

Common on the sandy and gravelly soils of lower slopes in the ancient delta remnants at the mouth of Tunnelelv, and on the gravelly knolls and the terraces bordering its lower channels. Occasional in hummocky wet meadows and in the heath borders of sorted nets. Thus it grows over a relatively wide range in the moisture gradient, from merely damp sand and gravel to wet mossy turf. In the delta remnants it grows in open cover (11–20%), but ranges from this to dense cover of 81–90%. It appears to be confined to the more stable surface soils.

The common occurrence of this species in the *Cassiope* heaths has been noted by both GELTING (1934, p. 29) and SØRENSEN (1933, p. 19–20). SØRENSEN mentions it in only one ecosystem in his moderately moist series (1937, p. 112): Well-drained fields, the description of which indicates that they are characterized by *Cassiope tetragona*. GELTING, however (l. c.), mentions finding it in *Vaccinium* heaths, and OOSTING (1948, p. 253) noted it in partially desiccated moss mats in seepage areas. In the latter site it appears to have been in relatively open vegetation.

Chamaephyte with herbaceous, perennial, above-ground, ascendant stems, and with adventitious roots (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 20; HULTÉN, Circ. Pl., p. 52, map 46; POLUNIN, Circ. Fl., p. 4). In Greenland it is widespread on all the coasts (BHJ., p. 36).

### *Lycopodium annotinum* L.

Common locally in the dense cover formed by *Cassiope tetragona*, *Vaccinium uliginosum* and mosses on moist gelifluction lobes or rock benches on mountain slopes. The Mesters Vig plants represent var. *pungens* (LA PYLAIE) DESV.

SØRENSEN noted this species in *Cassiope* heath vegetation in the southern districts of the fjord region (1933, p. 19), and later placed it in two ecosystems in his moderately moist series (1937, p. 136): Sheltered precipices and rock ledges, and Well-drained fields. All of these observations are consistent with those at Mesters Vig.

Chamaephyte (BÖCHER, 1938, p. 59–60).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 19–20; HULTÉN, Circ. Pl., p. 70, map 62). In Greenland it ranges throughout the coastal areas northward to about lat. 74° (BHJ., p. 36; PORSILD, Ill. Fl., map 9).

### *Botrychium Lunaria* (L.) Sw.

Found only twice in the Mesters Vig district. It was collected on a steep, south-facing slope on the southeast side of Hesteskoen. The slope was partially covered with grasses, *Vaccinium uliginosum*, *Betula nana*, and *Salix arctica*, and the soils were sandy, relatively dry in mid-July and subject to creep. The other specimen, collected in the vicinity of Ekspeditionshus by GUDMUNDSSON and BJÖRNSSON, was seen in the Herbarium of the Museum of Natural History of Iceland.

SØRENSEN's note on the habitat of this species in 1933 (p. 20) was "on slope with southern exposure and herbaceous vegetation." Later he designated an ecosystem in his moderately moist series for this habitat: Herb mats, on sheltered sunny slopes (1937, p. 137). His description suggests a somewhat more moist site than the one in which *Botrychium Lunaria* was growing at Mesters Vig.

Geophyte, with rather fleshy adventitious roots (BÖCHER, 1938, p. 47).

Geographic distribution: Circumpolar (HULTÉN, Circ. Pl., p. 112, map 103; Hist. Arct. & Bor. Biota, p. 121; CLAUSEN, Mem. Torr. Bot. Club, v. 19, p. 63). In Greenland it occurs in the southerly coastal districts, extending northward in the west to about Disko, and in the east to the northern part of Traill Ø (BHJ., p. 44–5; SØRENSEN, 1933, p. 20).

### *Woodsia glabella* R. BR.

Found on dry to moderately moist sites, usually in sandy soil or grus, and in relatively open vegetation (vascular plant coverages of 1% to 20%). On the disturbance gradient it is commonly found in both

stable and disturbed soils such as the loose stony grus on the tops of trap ridges, and in sandy and shaly debris islands on the summit of Hesteskoen.

These observations in the Mesters Vig district, on the range of the species in the moisture and coverage gradients, are in general agreement with those of GELTING and SØRENSEN. GELTING (1934, p. 30–1) found it in crevices, screes and grass heaths, while SØRENSEN (1937, p. 112) placed it in "Dry loess fields and terraces" among his dry ecosystems, and on the "Fronts of earth glaciers" among his moderately moist ones. Its presence in apparently active debris islands on Hesteskoen, however, suggests greater tolerance of physical disturbance than previous notes indicate.

Hemicryptophyte with short, oblique rhizome and fibrous adventitious roots (GELTING, l. c., p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 17; HULTÉN, Circ. Pl., p. 44, map 38; POLUNIN, Circ. Fl., p. 16). In Greenland it is found in all the coastal areas (BHJ., p. 46).

### *Cystopteris fragilis* (L.) BERNH.

Occasional to common on ledges and in crevices, often in loose, rather dry sandy soil, and sometimes found growing in the stony grus on the tops of trap knolls and ridges. On the coverage gradient it appears to be intermediate (11 % to 40–50 %), and although it grows in dry sites it is most abundant on damp ledges with relatively stable surface soils. According to BHJ (p. 48) all of the northern Greenland specimens of *C. fragilis* represent ssp. *Dickieana* (SIM) NYL., but the Mesters Vig material appears to be the typical species.

SØRENSEN (1937, p. 112) placed this species in a single ecosystem: Sheltered precipices and rock ledges, but that it has a somewhat wider range of habitat tolerance is shown by the observations at Mesters Vig, and also by those of GELTING (1934, p. 29–30) who found it on screes and in grass heaths.

Hemicryptophyte with short, oblique rhizome and fibrous adventitious roots (GELTING, l. c., p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 18; HULTÉN, Circ. Pl., p. 62, maps 55, 56; POLUNIN, Circ. Fl., p. 13). In Greenland it occurs (sens. lat.) in all the coastal areas (BHJ., p. 48).

### *Triglochin palustris* L.

Found in a single locality in the Mesters Vig district, where it was growing abundantly among sedges in a saturated moss mat on the border of a small lake among the hills on the Nyhavn peninsula.

SØRENSEN (1933, p. 166) and GELTING (1934, p. 220–1) have reported it in similar situations. However, SØRENSEN, in listing it among his ecosystems (1937, p. 138) mentions it only in "Seasonally submerged alluvial meadows," to which it is not restricted.

Hemicryptophyte with fibrous adventitious roots, and the stems rising singly (GELTING, l. c., p. 220, 295).

Geographic distribution: Circumpolar (HULTÉN, Circ. Pl., p. 112, map 104; POLUNIN, Circ. Fl., p. 29; GRÖNTVED, Fl. Icel., p. 127). In Greenland it extends around the southern coasts, northward in the west to Disko, and in the east to about lat. 73°35′ (BHJ., p. 306–7; GRÖNTVED, l. c., SEIDENFADEN & SØRENSEN, 1937, p. 180).

### *Festuca brachyphylla* SCHULTES

*Festuca ovina* L. var. *brevifolia* (R. BR.) HARTM.

Common on the drier sites in sandy and gravelly soils, though occasionally found in fairly wet sandy soils. Usually in vegetation of low density (vascular plant coverages ranging from less than 1% to 40%). On the disturbance gradient it occupies many sites that are relatively stable, though some are subject to dry creep or deflation by wind. On the other hand it grows in some of the least stable soils of the area, in the moving surficial materials on the tops of the large till gelifluction lobes high on the mountain slopes.

The suggestion of wide tolerance in this species on the moisture gradient seen at Mesters Vig is extended and corroborated by observations elsewhere in the fjord region; and by implication the same is true for the coverage gradient. GELTING (1934, p. 191–2) states that it occurs in a large number of different plant associations, in very dry and in moderately damp soil. SØRENSEN (1937, p. 115) listed it in no less than five ecosystems ranging from the driest, "Barren ground," to one of the wettest, "Constantly irrigated fields." It is of interest, however, that none of these ecosystems involves much disturbed surficial soil, though some of the irrigated fields and the "Fronts of earth glaciers" are subject to mass flowage.

Hemicryptophyte, densely caespitose, with many fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 40; HULTÉN, Circ. Pl., p. 24, map 17). In Greenland it is found in all the coastal areas except the north (BHJ., p. 274). PORSILD (l. c., map 53) gives several localities for it on the north coast of Greenland, possibly because he included it in the closely related *F. hyperborea.*

### *Festuca baffinensis* Polunin

This species was not seen in the Mesters Vig study area immediately south of Nyhavn and Noret, but was collected by Gudmundsson and Björnsson in the vicinity of Ekspeditionshus, in Mesters Vig (bay) (Herb. H. R.). Its habitats in Greenland generally have been noted as stream banks, heaths, snow-beds, and fell-fields. These suggest the tolerance ranges on coverage and moisture gradients found in *F. brachyphylla*. But they can be merely suggestions, and there is nothing to show relations to disturbance gradients.

Hemicryptophyte, caespitose, with fibrous adventitious roots.

Geographic distribution: Arctic and alpine North America, Greenland, Spitzbergen (Polunin, Circ. Fl., p. 52; Porsild, Ill. Fl., p. 40, Map 54). In Greenland it is known on the north coast, on the west coast south to the Nûgssuaq peninsula, and on the east coast south to Scoresby Sund (BHJ., p. 273–4; Böcher, 1958).

### *Festuca vivipara* (L.) Sm.

*Festuca ovina* L. var. *vivipara* (L.) Horn.

Occasional to common in wet moss-sedge meadows and on the silt loams at low altitudes near the shores of the fjord. These loams, though wet and mirelike in spring, are dry and brittle at the surface by midsummer. Thus this species lives under a wide range of conditions in the moisture gradient, from nearly continuous saturation throughout the growing season to intense desiccation in middle and late summer. In the vascular plant coverage range it is found in vegetative densities as low as 1 % and as high as 81–90 %. In general, it grows in surface soils that are fairly stable.

Gelting (1934, p. 192) noted the habitat of this species as "moderately damp soil and in closed vegetation" while Sørensen (1937, p. 115) placed it in a moderately moist ecosystem on the "Fronts of earth glaciers," and in a wet one in "Constantly irrigated fields." Its occurrence on the desiccated silt loams at Mesters Vig greatly expands its known range of tolerance in the moisture and coverage scales. However, as in the case of *Festuca brachyphylla*, these observations elsewhere give no indication of greater tolerance of disturbance than it shows at Mesters Vig.

Hemicryptophyte, densely caespitose, with many fibrous adventitious roots (Gelting, 1934, p. 294).

Geographic distribution: Amphi-Atlantic with extensions into western arctic Canada and eastern arctic Eurasia (Hultén, Amph, Pl., p. 36, map 17; see also Polunin, Circ. Fl., p. 54–5). In Greenland it is known in all the coastal areas (BHJ., p. 274).

### ***Festuca rubra*** L. ssp. ***cryophila*** (V. KRECZ. & BOBR.) HULTÉN

*Festuca rubra* L. var. *arenaria* of auth., not (OSBECK) FRIES.

Common on the silt loams at low altitudes near the shore of the fjord, and occasional in wet meadows, on turf hummocks, or in heath tundra. The silt loams become dry and brittle at the surface in summer. Consequently this species grows under a wide range of moisture conditions, from very dry to very moist. Likewise it may be found in vascular plant coverages of 1–5%, and as great as 81–90%. However, on the disturbance gradient it grows in surface soils that are relatively stable.

SØRENSEN (1937, p. 115) listed this species in a single ecosystem, in his dry series: "Sunny slopes, in herbaceous vegetation." GELTING, on the other hand (1934, p. 193–4), found it also in "damper soil among moss," suggesting the wider range of tolerance of variation in moisture that is so striking at Mesters Vig.

Hemicryptophyte with many underground stolons and fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 40; HULTÉN, Circ. Pl., p. 64, map 57 B; POLUNIN, Circ. Fl., p. 54; GRÖNTVED, Fl. Icel., p. 138–9). In Greenland it is known in the eastern coastal areas north to lat. ca. 75°, and on the west to lat. ca. 73° (BHJ., p. 276).

### ***Colpodium Vahlianum*** (LIEBM.) NEVSKI

*Puccinellia Vahliana* (LIEBM.) SCRIBN. & MERR.

Occasional on the silt loam soils at low altitudes near the shores of the fjord. These loams are wet and mire-like at the time of snow-melt in spring, but soon become dry at the surface, brittle, and cracked into domed polygonal forms. This species grows on the dry silts, or sometimes in the damp sandy soils associated with them near the bases of the neighboring hills. It was found in vascular plant densities ranging from 6–20%, and in soils that appear to be relatively stable at the surface. The damp sands, however, if they retain their moisture into the autumn, probably are frost heaved.

GELTING found this species growing on damp, mostly clayey, bare soil (1934, p. 212–13), a habitat reminiscent of the one in which it was seen at Mesters Vig. SØRENSEN, however, gives it a somewhat wider range of habitats: "damp places in rocky territory saturated with water or inundated in spring" (1933, p. 156). In 1937 (p. 115) he listed it in two of his moist to wet ecosystems: Constantly irrigated fields, and Solifluction clay. Its presence in the latter site is a further suggestion that it has some capacity to survive disturbance due to frost heaving.

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Regarded as amphi-Atlantic by PORSILD (Ill. Fl., p. 32–3; cf. also SØRENSEN, Revis. Gr. Pucc., p. 18–20, fig. 101, and POLUNIN, Circ. Fl., p. 46); but HULTÉN (Circ. Pl., p. 8, map 1) has recently mapped it as circumpolar on the basis of widely scattered stations in northern Eurasia. In Greenland it occurs in the northerly coastal areas, reaching south to Disko in the west and to Scoresby Sund in the east (SØRENSEN, l. c., BHJ., p. 286).

### ***Puccinellia angustata*** (R. BR.) RAND & REDF.

Occasional on the silt loam soils on the long gentle slopes at low altitudes near the shores of the fjord. These soils are wet and mire-like at the time of snow-melt, but soon become dry and cracked at the surface, nearly barren of vegetation. Thus the species was found only in low vascular plant coverages (less than 1 % to 10 %), and in soils subject to a wide seasonal range in the moisture gradient. These soils appear to be relatively stable, at least at depths of 2 to 5 cm.

As noted under *P. coarctata*, the latter, a sea strand species, was confused with *P. angustata* in earlier habitat notes. GELTING's comments are probably applicable, for they refer to upland sites (1934, p. 210–11). He found *P. angustata* on old Eskimo house sites, usually on extremely dry soil, never in "closed associations," and growing in either sand or clay. Assuming that SØRENSEN's upland habitats for *P. angustata* refer to this segment of the species complex, he noted it on "dry solifluction soil" (1933, p. 155), and in a dry ecosystem: Clayey flats and raised beaches (1937, p. 115). These notes are consistent with observations at Mesters Vig.

Hemicryptophyte, caespitose, with fibrous roots.

Geographic distribution: Amphi-Atlantic (SØRENSEN, 1953, p. 87), ranging through the high Arctic from the western Canadian Arctic Archipelago to the eastern part of the Taimyr Peninsula (SØRENSEN, l. c., p. 28–30; PORSILD, Ill. Fl., map 46). Farther east it is replaced by the closely related arctic Siberian *P. contracta* (LANGE) SØRENSEN. In Greenland it is known in the northerly coastal districts southward on the west coast to 68°30′, and on the northeast coast to Scoresby Sund (SØRENSEN, l. c., fig. 104; BHJ., p. 283).

### ***Puccinellia coarctata*** FERN. & WEATH.

*Puccinellia angustata* (R. BR.) RAND & REDF. of auth., in part.

Scattered plants of this species were found on damp muddy and sandy sea beaches. They were in low vascular plant coverages (less

than 1% to 10%), and in situations subject to some physical disturbance due to wave and ice action. They were only found, however, on shelving beaches with relatively quiet water offshore.

When GELTING's and SØRENSEN's observations were being made in Northeast Greenland *Puccinellia coarctata* was not distinguished from *P. angustata*. The latter species is not usually found on sea shores; consequently only those earlier habitat notes on this species group referring to sea strands probably apply to *P. coarctata*. They might apply also to *P. Andersonii*, but this species was not collected at Mesters Vig. SØRENSEN noted "*P. angustata*" "on shores" in 1933 (p. 155), and in 1937 (p. 115) placed it in one of his moist to wet ecosystems: Sea shore lagoons.

Hemicryptophyte, caespitose, with fibrous roots.

Geographic distribution: Amphi-Atlantic (SØRENSEN, 1953, p. 42–46, 98; HULTÉN, Amph. Pl., p. 280, map 262), ranging from Newfoundland and southern Labrador eastward to Iceland, the Faeroes, northern Scandinavia, and Waigatsch. In Greenland it is known in the southerly coastal districts, northward in the west to about Disko and in the east to about lat. 66° with isolated areas farther northward between Scoresby Sund and about lat. 73°15′ (SØRENSEN, l. c., fig. 110; BHJ., p. 285).

### ***Puccinellia phryganodes*** (TRIN.) SCRIBN. & MERR.

Common locally on the damp sand of upper sea beaches, where it sometimes forms tangled mats. In general, it grows in vegetation of low density (6–10%), is confined to wet, brackish, sandy soil, and is subject to considerable physical disturbance by wave and ice action. However, it was found only on shores that were protected from violent wave action.

The observations of GELTING (1934, p. 211–12), SØRENSEN (1937, p. 134) and OOSTING (1948, p. 249–50) indicate that littoral meadow habitats in which this species grows are much more extensively developed elsewhere in the fjord region than they are at Mesters Vig.

Hemicryptophyte, loosely caespitose, with creeping, above-ground stolons and fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (SØRENSEN, Revis. Gr. Pucc., p. 51–61, fig. 112; HULTÉN, Circ. Pl., p. 192, map 182; PORSILD, Ill. Fl., p. 38; POLUNIN, Circ. Fl., p. 73). Known in all the Greenland coastal areas except the extreme northeast (SØRENSEN, l. c., BHJ., p. 286).

### ***Poa pratensis*** L. ssp. ***alpigena*** (FR.) HIIT.

*Poa alpigena* (FR.) LINDM.

Occasional or locally common in hummocky wet meadows, in heath tundra, or on the steep turfy fronts of large till gelifluction lobes. It was

found only in relatively moist sites, and in vascular plant coverages ranging from 61 % to 90 %. It was seen for the most part in fairly stable surface soils, though the fronts of large gelifluction lobes are subject to soil movement that may at times become disruptive. Occasional as a weed around habitations.

Observations elsewhere in the fjord region are in general agreement with the above. GELTING (1934, p. 198–201) found the species in heaths and grass meadows, and noted it as numerous on old Eskimo sites. SØRENSEN (1937, p. 115) listed it in two of his moderately moist ecosystems: Sheltered precipices and rock ledges, and Fronts of earth glaciers.

Geophyte, with horizontal non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 28–9; HULTÉN, Circ. Pl., p. 14, map 7), both as *P. alpigena* (FR.) LINDM.). For its Greenland range PORSILD's map (l. c., map 29) is used, showing that it extends along the western coast from lat. 60° to lat. ca. 74°, and along the east coast from about lat. 68°30′ to about 73°. *Poa pratensis* is treated as a collective species by BHJ (p. 279), and ssp. *alpigena* is not recognized.

### ***Poa arctica*** R. BR.

A common species on a wide variety of sites. It grows in the loose, blowing sand of upper sea beaches, on dry sandy knolls and sand deposition areas in the ancient delta remnants, and on dry, stony till knolls. At the same time it is common in hummocky wet meadows and in the damp moss of turf hummocks. Intermediate sites in the moisture scale occupied by it are on the upper gravel terraces bordering the mouth of Tunnelelv, and in heath tundra on the mountain slopes. In the vascular plant coverage gradient it is found in coverages as low as 1–5 % and as high as 81–90 %. It withstands a great deal of physical disturbance in blowing sand, and also by frost heaving in sandy and shaly debris islands (on the summit of Hesteskoen), or on the fronts and margins of small, active silt gelifluction lobes. It is common in the actively moving soils on the tops of large till gelifluction lobes. On the other hand, it grows in many sites whose surface soils are essentially stable. Common as a weed in disturbed soils around habitations.

*Poa arctica* is treated here in the broad sense, though ssp. *caespitans* (SIMM.) NANNF. is occasionally seen in the Mesters Vig district along with the more typical form.

The wide tolerance of this species on the moisture gradient at Mesters Vig is consistent with observations elsewhere. GELTING (1934, p. 206–8) found it in heaths, bogs, meadows, grass mats, and in old Eskimo sites.

SØRENSEN (1937, p. 115) listed it in six different ecosystems ranging from dry through all of his moderately moist series, and into the moist to wet. Judging by his descriptions, none of these is affected by much currently active disturbance in the surficial soils, nor did he observe the species in very open vegetation. OOSTING, however (1948, p. 258), found it on loose, dry gravel slopes, where it probably was in open cover.

Geophyte with horizontal, non-tuberous rhizomes and fibrous adventitious roots, or (in the occasional ssp. *caespitans*) caespitose (GELTING, 1934, p. 206, 297).

Geographic distribution: Circumpolar (HULTÉN, Amph. Pl., p. 24, map 6; PORSILD, Ill. Fl., p. 29–30; POLUNIN, Circ. Fl., p. 66). In Greenland it is known, sens. lat., in nearly all the coastal areas (BHJ., p. 278–9). If ssp. *caespitans* is recognized as a separate taxon, it is shown by HULTÉN (l. c., p. 24, map 5) to have an amphi-Atlantic range, extending to Novaya Zemlya in the east and the western Canadian Arctic Archipelago in the west. In Greenland the ssp. appears to replace the typical form on the north coast, and to be mixed with it on the northwest and northeast coasts (cf. PORSILD, l. c., maps 31, 32).

### ***Poa alpina*** L.

Common in a wide variety of sites, ranging from the dry gravels on the tops of slushflow fans, to the drying cracks that appear in the silt loams on lower slopes, and to wet, mossy hummocky meadows. It is found at nearly every point in the moisture gradient except in the most completely saturated moss-sedge meadows or in shallow water. On the vascular plant coverage gradient it grows in the most open cover on the dry silts and gravels (less than 1 %) but at the other end of the scale it is often found in dense heath tundra, in cover of 81–90 %. It appears capable of surviving a considerable amount of physical disturbance, for it is found in sandy debris islands near Myggesø, in small mountain stream channels that are subject to rather violent spring flooding, and in the actively moving surficial soils on the tops of large till gelifluction lobes. Viviparous plants are occasional (var. *vivipara* L.).

Earlier notes on the habitat of this species, made elsewhere in the fjord region, carry no mention of so wide a tolerance of site variation. GELTING (1934, p. 201–6) merely placed it on herb slopes with south exposure, or around old Eskimo habitations. SØRENSEN (1937, p. 137) listed it in a single, moderately moist ecosystem: Herb mats, on sheltered sunny slopes.

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar with much disrupted range (HULTÉN, Amph. Pl., p. 230, map 212; PORSILD, Ill. Fl., p. 30; POLUNIN, Circ. Fl., p. 66). In Greenland it is known in all the coastal areas northward to Melville Bugt in the west and to lat. ca. 74°30′ in the east (BHJ., p. 279).

### *Poa glauca* M. VAHL

A common species on dry to very moist sites, though probably most abundant toward the drier end of the moisture gradient. It is found in the gravelly soils of slushflow fans and talus slopes, in the coarse grus on trap ledges and ridge tops, in sandy soils among the ancient delta remnants and on till knolls, and in the fine-textured silt loams that become dry and brittle at the surface during the summer. In hummocky wet meadows, heath tundra, and on turf hummocks it grows in organic soil. On the vascular plant coverage gradient it appears nearly throughout, from coverages of less than 1 % to those of 81–90 %. It appears able to withstand a considerable amount of physical disturbance, for it is found in the centers of sandy and shaly debris islands (summit of Hesteskoen), in loose sand and grus subject to wind action, on sliding soil on steep river banks, and in the relatively fresh deposits on the tops of slushflow fans.

The wide tolerance on the moisture and coverage gradients shown by this species at Mesters Vig is indicated in large part, though not entirely, by observations elsewhere in the fjord region. GELTING (1934, p. 208–9) saw the species in most dry plant associations, but noted that it was still more frequent on bare sandy or gravelly soil (cf. also OOSTING, 1948, p. 258). SØRENSEN (1937, p. 115) listed it in six ecosystems, four of which are in his dry series, and the other two in the moderately moist ones.

Hemicryptophyte, densely caespitose, with many fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 30; HULTÉN, Circ. Pl., p. 28, map 21; POLUNIN, Circ. Fl., p. 66). In Greenland it is known in all the coastal areas (BHJ., p. 278).

### *Poa Hartzii* GAND.

This species was not seen in the study area in the vicinity of the Nyhavn and Labben peninsulas, but was collected by GUDMUNDSSON and BJÖRNSSON near Ekspeditionshus, in Mesters Vig (bay) (Herb. H. R.).

SØRENSEN (1933, p. 145–55) and GELTING (1934, p. 209–10) have both noted this plant as occurring near the seashores, commonly on sand dunes. GELTING also found it on hard, dry clayey areas, and both

listed it among the species found around bird roosting places (cf. also SØRENSEN, 1937, p. 115).

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Amphi-Atlantic (HULTÉN, Amph. Pl., p. 178, map 159; PORSILD, Ill. Fl., p. 30; cf. also POLUNIN, Circ. Fl., p. 66). It occurs on the west coast of Greenland southward to Disko, and on the east coast southward at least to Kong Oscars Fjord (BHJ., p. 278).

### *Poa abbreviata* R. BR.

A single collection of this plant was made from sandy debris islands on the summit of Hesteskoen (no. 671), and it was not seen elsewhere in the Mesters Vig district. The sandy soil in which it was growing was relatively dry in mid-July, and probably is subject to considerable physical disturbance by frost heaving at some time each year. The vascular plant cover on these debris islands is very low (1–5 %).

SØRENSEN in 1933 (p. 141–2) described the habitat of this species as "dry, gravelly windswept places." He listed it in two of his ecosystems, both in the dry series: Barren ground, and Clayey flats and raised beaches (1937, p. 115). These observations are consistent with those at Mesters Vig, though the latter also suggest that *Poa abbreviata* can survive some disturbance due to frost heaving.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Although listed by HULTÉN (Amph. Pl., p. 20, map 2) and by PORSILD (Ill. Fl., p. 30) as having an amphi-Atlantic range, HULTÉN states that the species may in reality be circumpolar. He extends its range eastward from Greenland in the high Arctic to the Taimyr Peninsula, and recognizes an isolated station on Wrangel Island. Westward he extends it into northern Alaska. In Greenland it is known in the northerly coastal areas, southward in the west to Disko Bugt and Disko, and in the east to lat. ca. 69° (BHJ., p. 277–8; PORSILD, l. c., map 36).

### *Trisetum spicatum* (L.) RICHTER

Common in a wide range of habitats. It is found in the dry sandy or gravelly soils of the ancient delta remnants, till knolls and steep river bluffs, and it is not uncommon on the low altitude silt loams that become dry and cracked at the surface in summer. At the same time it grows in sandy and silty soils that remain damp throughout the summer, in wet turfy and hummocky meadows, in the organic soils of turf hummocks and heath tundra. It is found throughout most of the vascular plant

coverage gradient, from less than 1% to 90%. Although it grows for the most part in soils that are relatively stable in the upper 10–15 cm, that it does withstand some physical disturbance is shown by its presence on the loose soil of steep river bluffs, on the freshly exposed soil of new slides, in the centers of at least partially active sorted nets and (?) ice-wedge polygons (experimental site 20). Common as a weed in disturbed soils around habitations. The Mesters Vig plants all represent var. *Maidenii* (GAND.) FERN., which has the panicles more or less interrupted, at least near the base.

The wide tolerance of this plant with relation to moisture and coverage has not been previously described in one place, but some suggestion of it can be gained when all the notes are taken together. SØRENSEN in 1933 (p. 157) gave its habitat as "dry snow-patches." GELTING in 1934 (p. 213) said that it was common "especially on dry soil." But SØRENSEN, when he listed the species among ecosystems, placed *Trisetum spicatum* in only one, in the moist to wet series: Sheltered sunny slopes and patches. A subtitle for this ecosystem was "Meagre hygrophilous herb mats."

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 28; HULTÉN, Circ. Pl., p. 60, map 54; POLUNIN, Circ. Fl., p. 74). In Greenland the species is found in all the coastal areas (BHJ., p. 290).

### ***Arctagrostis latifolia*** (R. BR.) GRISEB.

Occasional to common in wet moss-sedge meadows or hummocky wet meadows. It was found only in these very moist to wet sites, and in vascular plant coverages ranging from 71–90%. The surface soils in these habitats appear to be relatively stable.

Judging by earlier observations this species is more common and occupies more sites elsewhere than at Mesters Vig. GELTING (1934, p. 184) found it forming "extensive meadows and infra-aquatic bogs," and SØRENSEN (1933, p. 134–5) noted it in swamps, grass moors and bogs "on a substratum of solifluction soil". When the latter arranged the species in ecosystems he placed *Arctagrostis* in three of the moist to wet series: Earth glaciers and sliding slopes, Solifluction clay, and Water-soaked ground. This not only extends its range in the coverage gradient, but indicates that it has capacity to survive rather intense disturbance by frost heaving.

Geophyte with non-tuberous horizontal rhizomes and fibrous adventitious roots (GELTING, 1934, p. 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 24; HULTÉN, Circ. Pl., p. 18, map 12; POLUNIN, Circ. Fl., p. 40). In Green-

land it extends around the northerly coasts, southward in the west to Disko Bugt and Disko, and in the east to Scoresby Sund (BHJ., p. 287; PORSILD, l. c., map 17).

### *Calamagrostis purpurascens* R. BR.

*Calamagrostis arundinacea* (L.) ROTH var. *purpurascens* (R. BR.) GELERT.

Common locally, forming dense tufts in loose, stony grus on the tops of trap knobs and ridges, or on dry stony till knolls. On ledges its habitats are sometimes moderately moist, but usually they are near the dry end of the moisture gradient. On open ridge tops the density of vegetation usually is low (11–20 %) but on ledges or in depressions this species is found in cover of 60–70 %. The surface soils in which it grows are relatively stable.

Observations of this species elsewhere in the fjord region are consistent with the above. Sørensen (1933, p. 135–6) found it on dry, windswept slopes and hills. GELTING (1934, p. 185–6) considered it an extremely xerophilous species, growing mostly in loose, dry, warm sand. SØRENSEN (1937, p. 115) listed it in two of his drier ecosystems: on Disintegrating summits and crests, and in Bird places.

Hemicryptophyte, densely caespitose, with many fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Eastern Asia (from the Olenek and Lena Rivers) eastward through boreal America to East Greenland (HULTÉN, Fl. Al., p. 170–1); POLUNIN, Circ. Fl., p. 42–3). In Greenland it extends along the west coast from about lat. 64° to about lat. 79°. It occurs on much of the north coast, and extends down the northeast coast to Scoresby Sund (BÖCHER, 1954, p. 189; HBJ., p. 294; cf. also SØRENSEN, 1954, p. 11–15).

### *Phippsia algida* (SOL.) R. BR.

Common in two kinds of sites in the Mesters Vig district. One is on upper sandy sea beaches beyond the reach of ordinary high tides, and the other is on the clayey silt loams that form long gentle slopes extending from the shores of the fjord to the bases of the neighboring hills and mountains. In both situations the species is found under both wet and extremely dry conditions. Where the sand of the high beaches is moistened by drainage from above the plants grow profusely and form mats, but they also grow on the open sandy beach ridges where the sand is blown about by the wind. The silt loams are wet and mire-like for a short time during spring snow-melt, but they soon become dry and cracked, to remain so throughout the summer. On the vascular plant coverage gradient the species was found only in the lower categories

(less than 1 % to 20 %). In the scale of its resistance to physical disturbance it appears to be intermediate. The silt loams, where it is found, seem to be fairly stable, but on the upper sea beaches it is subject to being blown out by the wind. Found as a weed around habitations near the shore.

In earlier descriptions of the habitat of this species it is associated entirely with damp or wet soil (SØRENSEN, 1933, p. 140–1; GELTING, 1934, p. 195–6). SØRENSEN (1937, p. 115) listed it in three ecosystems, all in the moist to wet series: Snowpatches and polygon fields, Constantly irrigated fields, and Seashore lagoons. It is difficult to judge the position of the plant in the disturbance gradient on the basis of these notes. The surficial soils of the irrigated fields probably are fairly stable except for mass flowage. The description of the polygon fields indicates that they were active, but it also states that most of the plants were at the stony borders of the polygons, which were no doubt relatively stable.

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (Gelting, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 24; HULTÉN, Circ. Pl., p. 8, map 2; POLUNIN, Circ. Fl., p. 59). In Greenland it is known in all the coastal areas (BHJ., p. 287).

### *Hierochloë alpina* (Sw.) R. & S.

Occasional to common in the dry, rather loose stony grus on trap knobs and ridges, or in sand and gravel on the ancient delta remnants. Where found it was always in relatively dry soil, in open vegetation (vascular plant coverage 11–20 %) and in situations where the surface materials were relatively stable though in some cases subject to a certain amount of disturbance due to dry creep or to blowing by wind during the summer.

Observations elsewhere in the fjord region give this species a somewhat wider range in the moisture and coverage gradients than it shows at Mesters Vig. GELTING's notes (1934, p. 194–5) suggest habitats much like those at Mesters Vig: bare, sandy or gravelly soil, or xerophilous grass heaths. SØRENSEN, on the other hand (1937, p. 115), placed it in three moderately moist ecosystems: Sheltered precipices and rock ledges, on the Fronts of earth glaciers, and in Well-drained fields. In doing this he not only extended it over more of the moisture gradient, but also placed it in dense heath vegetation. The surficial soils in all of the sites, however, are relatively stable.

Geophyte, with horizontal, non-tuberous rhizomes; but mostly having a densely caespitose form, with many fibrous adventitious roots (GELTING, 1934, p. 194, 297).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 22; HULTÉN, Circ. Pl., p. 20, map 13; POLUNIN, Circ. Fl., p. 55). In Greenland it is known in all of the coastal districts except the extreme south and a part of the southeast (BHJ., p. 299; PORSILD, l. c., map 12; SØRENSEN, 1954, p. 10, fig. 6).

### *Eriophorum Scheuchzeri* HOPPE

Common in wet, moss-sedge meadows such as develop in the sheet-flow areas below melting snowdrifts, or at the margins of shallow lakes. In the latter this species often grows offshore in the shallow water. Occasional on turf hummocks, sometimes persisting on them to the later stages of disintegration, and suggesting that the plants are able to withstand considerable desiccation. In the vascular plant coverage gradient the species grows under a wide range of conditions, from scattered individuals in areas otherwise nearly free of vascular plants, to dense stands in association with heaths, *Dryas*, *Carex*, and a few grasses. The surficial soils (upper 10–15 cm) in most of its habitats appear to be relatively stable though they may be subject to mass movement.

Observations elsewhere in the fjord region make no substantial additions to the above habitats, with one possible exception. SØRENSEN (1937, p. 115) included "Solifluction clay" among the ecosystems in which he found the species. It is presumed from his description that the soil here was actively frost heaved, and if so *Eriophorum Scheuchzeri* was demonstrating a capacity to survive it.

Helophyte with creeping rhizomes and fibrous adventitious roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 42; HULTÉN, Circ. Pl., p. 26, map 19; POLUNIN, Circ. Fl., p. 107). It is known in all the coastal districts of Greenland (BHJ., p. 240).

### *Eriophorum callitrix* CHAM.

Occasional or locally abundant in wet moss-sedge meadows or wet hummocky meadows. Found once on a wet sandy flat near Nyhavn (no. 265). Usually found in areas with relatively dense vascular plant coverage, and in fairly stable surface soils.

Observations elsewhere in the fjord region are consistent with the notes made at Mesters Vig (cf. GELTING, 1934, p. 179–80; SØRENSEN, 1933, p. 126–7; OOSTING, 1948, p. 251). SØRENSEN listed the species on "Earth glaciers and sliding slopes" (1937, p. 115), suggesting that it might be growing on surficially disturbed soils, but his description of this ecosystem indicates that the surface materials are relatively stable except for mass flowage.

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: PORSILD considered this species a "North American Radiant," extending westward in Asia to the Khatanga River and eastward to Northeast Greenland (Ill. Fl., p. 43, map 62). Recently, however, HULTÉN (CIRC. Pl., p. 12, map 6) has included it among the circumpolar species, probably on the basis of a reported collection from the Kara tundra. It is known in Greenland only on the northeast coast north of Scoresby Sund (BHJ., p. 240; PORSILD, l. c.).

### ***Eriophorum triste*** (TH. FR.) HADAČ & LÖVE

*Eriophorum polystachyum* L. var. *tristis* TH. FR.

This is the commonest species of *Eriophorum* in the Mesters Vig district. It grows in wet moss-sedge meadows, hummocky wet meadows, and on both developing and deteriorating turf hummocks. On the coverage gradient it was noted in vascular plant coverages as low as 11–20% and as high as 81–90%. The surface soils in most of its habitats are relatively stable, though some are subject to mass movement. It was found, however, on the fronts and lower margins of small, active silt gelifluction lobes, so that it is apparently able to withstand some physical disturbance.

GELTING (1934, p. 180–1) regarded this species as one of the commonest in the bogs, and both he and SØRENSEN noted that it was able to survive a certain amount of desiccation. He said that it was not always in damp soil, but might be found in dry heaths. SØRENSEN (1933, p. 129–32) saw it in "more or less damp grassy places." One of the ecosystems in which SØRENSEN listed it (1937, p. 115) was Solifluction clay, which lends support to the suggestion gained from the Mesters Vig observations: that the species can survive physical disturbance in the surface soils.

Geophyte, with short, horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Considered by PORSILD (Ill. Fl., p. 42; 1958, map 4) as amphi-Atlantic; but more recently HULTÉN (Amph. Pl., p. 11; Circ. Pl., p. 58, map 52) indicates that it is circumpolar. In Greenland it is known only in the northerly coastal districts, southward in the west to the Disko region, and in the east to Scoresby Sund (BHJ., p. 240; PORSILD, l. c., map 59).

### ***Kobresia myosuroides*** (VILL.) FIORI & PAOL.

*Kobresia Bellardi* (ALL.) DEGL.
*Elyna Bellardii* (ALL.) K. KOCH

Occasional to common in dry, loose sandy soil on steep ledgy slopes, or in loose stony grus on the tops and upper slopes of trap knobs and

ridges. It was found only in the drier part of the moisture gradient, and in relatively open vascular plant coverages (11–20%). It appears capable of withstanding a considerable amount of physical disturbance due to creep in its loose substratum, for it colonizes the margins of sliding talus slopes of grus among the trap ridges.

Notes made elsewhere in the fjord region by GELTING (1934, p. 178–9) and SØRENSEN (1937, p. 115) extend the range of this species over somewhat more of the moisture gradient that it shows at Mesters Vig. GELTING found it in more or less damp soil in grass meadows, and SØRENSEN listed it in two of his moderately moist ecosystems: Sheltered precipices and rock ledges, and on the Fronts of earth glaciers.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 44; HULTÉN, Circ. Pl., p. 46, map 40; Outline Bor. Biota, p. 97). It is known in all the coastal districts of Greenland (BHJ., p. 242–3).

### ***Kobresia simpliciuscula*** (WAHLENB.) MACK.

*Kobresia bipartita* (ALL.) DALLE TORRE

Occasional to common in wet, moss-sedge meadows, usually in vascular plant coverages that are dense (81–90%). The turfy soils in which it grows appear to be relatively stable, though they are subject to mass movement.

Observations elsewhere in the fjord region by GELTING (1934, p. 178), SØRENSEN (1933, p. 125; 1937, p. 115), and OOSTING (1948, p. 251) are in general consistent with those made at Mesters Vig, with one possible exception. SØRENSEN, in 1933, remarked that he found the species growing mostly on mineral soil, whereas at Mesters Vig it was seen primarily on soils with a high proportion of organic matter.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar, but with a much disrupted range (HULTÉN, Amph. Pl., p. 232, map 213; cf. also PORSILD, Ill. Fl., p. 45). In Greenland it is known on the west coast from about lat. 73° south to about 62°30′ (PORSILD, l. c., map 70). BHJ (p. 243) give it a range on the north coast, and southward on the east coast to about Scoresby Sund.

### ***Carex nardina*** FR.

One of the commonest sedges in the district, occurring in a variety of sites. Although most commonly seen on the drier sites it is also found in the moist turf of hummocks, in the mosses of heath tundra, and in damp sandy soils kept moist during the summer by meltwater from

snowdrifts and thawing ground. It grows in nearly all vascular plant coverage categories, from less than 1 % on the dry, clayey silt loams at low altitudes bordering the fjords, to the dense tundra on damp slopes and ledges. However, it is most abundant in the more open vegetation. On the disturbance gradient, it grows in the relatively stable surface materials of moist heath tundra and the well-drained gravels and sands of ancient river terraces, delta remnants and till knolls; but at the same time it actively colonizes the sliding grus on talus slopes among the trap ridges, and grows in loose, creeping soil on dry ledgy slopes. On upper sea beaches, beyond the reach of high tides, it grows in blowing sand. Also it is found on active, non-sorted silt circles and silt gelifluction lobes, as well as in sandy and shaly debris islands (on the summit of Hesteskoen). Common as a weed in disturbed soil around habitations.

The abundance of this sedge, and its wide range throughout the coverage gradient, is attested by many notes in the writings of Sørensen (1933, p. 116–17), Gelting (1934, p. 166–8) and Oosting (1948, p. 257–8, 259, 259–60, 260–3). All agree to its concentration in the drier part of the moisture gradient, but Sørensen (1937, p. 114) placed it also in one of his moderately moist ecosystems: on the Fronts of earth glaciers, thus suggesting the wider tolerance noted at Mesters Vig. There is little in these earlier observations, however, to indicate the capacity of the species to survive physical disturbance, although Oosting noted that it appeared very soon on stabilizing sand dunes.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (Gelting, 1934, p. 295).

Geographic distribution: Amphi-Atlantic, extending westward to eastern Siberia, and eastward to northern Scandinavia, Spitzbergen and the Franz Josef Archipelago (Hultén, Amph. Pl., p. 186, map 168; Porsild, Ill. Fl., p. 47; cf. also Polunin, Circ. Fl., p. 103). Generally distributed in all the coastal districts of Greenland, though noted as rare on the southern part of the southeast coast (BHJ., p. 249–50; Böcher, 1954, p. 135, fig. 33).

### *Carex scirpoidea* Michx.

Abundant in wet moss-sedge meadows, hummocky wet meadows, and on both growing and deteriorating turf hummocks. Common also on turfy ledges, dry ledgy slopes, on the steep slopes of dry river bluffs, and on dry stony till knolls. Thus it occupies a wide range of sites in the moisture spectrum, and is common in several of them. In the wet meadows its immediate substratum is relatively stable though it may be subject to mass movement. However, the species is commonly found on the active surfaces as well as the fronts and lower margins of small silt gelifluction lobes; and on steep dry slopes the soils are subject to creep.

Consequently, on the disturbance gradient it has a wide range of tolerance. It is found in vascular plant coverages ranging from less than 1% to 90%.

Observations elsewhere in the fjord region have not given this species the wide tolerance seen at Mesters Vig, with the possible exception of its behavior on the moisture gradient. GELTING (1934, p. 174) noted it in dry bogs, with dwarf shrubs, or in damp heaths. SØRENSEN in 1933 (p. 122–3) gave its habitat merely as grass and dwarf shrub vegetations, and OOSTING (1947, p. 251) mentioned it only in connection with the wet meadow margins of ponds. SØRENSEN (1937, p. 136) listed it in a single ecosystem (moderately moist): on the Fronts of earth glaciers. All of these notes indicate sites with relatively dense cover and fairly stable soils. None represents a very dry site.

Geophyte, with short rhizomes and fibrous adventitious roots; often appearing caespitose (GELTING, 1934, p. 174, 296).

Geographic distribution: Regarded by HULTÉN (Amph. Pl., p. 188, map 170) as amphi-Atlantic, with its main area in America, an extension westward to Kamtchatka, and a single station in Norway (cf. also PORSILD, Ill. Fl., p. 49, map 74). In Greenland it is known in the western coastal districts north to about lat. 77°, and on the east coast northward to about 75° (BHJ., p. 255–6; PORSILD, l. c.).

### *Carex parallela* (LAEST.) SOMMERF.

Occasional or locally common in wet moss-sedge meadows, wet hummocky meadows, and on both growing and deteriorating turf hummocks. Although commonest in more or less saturated habitats, its persistence into the later stages of turf hummock development suggests that it can survive a certain amount of desiccation. It was noted only in relatively dense vegetation (vascular plant coverages of 71–90%). The turfy surface soils in which it grows are relatively stable though subject to mass flowage. In one place it was growing on the slumping front of a small, active silt gelifluction lobe, though even here the turf in which its roots lived probably moved as a mass.

This species appears to be limited to the habitats noted above, for other students in the fjord region have thus far found it nowhere else. SØRENSEN (1937, p. 137) placed it in a single ecosystem: Knolly bogs, which are the equivalent of the major turf hummock systems described at Mesters Vig. GELTING (1934, p. 168), by noting its habitat as "moderately damp bogs," suggests that it can stand some drying, as seen at Mesters Vig.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 296).

Geographic distribution: Amphi-Atlantic, with a limited range in Scandinavia, northern Russia, Novaya Zemlya, Spitzbergen, and East Greenland (HULTÉN, Amph. Pl., p. 82, map 63; cf. also POLUNIN, Circ. Fl., p. 104). The Greenland range of the species, as it is known thus far, extends from the Scoresby Sund district north to about lat. 74°25′ (BHJ., p. 251; GELTING, 1934, p. 168).

### *Carex rupestris* ALL.

Occasional to common in relatively dry sites such as gravelly talus, sand and gravel knolls in the ancient delta remnants, stony till knolls, loose stony grus on the tops of trap knobs and ridges, and steep ledgy slopes. On the other hand, it is occasionally found in damp sandy and silty soils kept moist during the summer by water from melting snow or thawing ground. It is also found in wet hummocky meadows and in densely vegetated heath tundra. Thus it shows a rather wide survival range on the moisture gradient, though it is most common on the drier sites. It occurs in vascular plant coverages ranging from less than 1 % to 90 %. Most of the soils it grows in are fairly stable, though some are subject to creep when on steep slopes, or to a certain amount of wind displacement in summer.

The species was noted by SØRENSEN in 1933 (p. 121–2) in habitats ranging from the driest to rather damp soil, also in bogs. GELTING (1934, p. 171) said it formed extensive heaths on dry sandy soil and also occurred in bogs. OOSTING (1948, p. 257–8, 259–60) saw it only in the drier sites. SØRENSEN (1937, p. 114) listed it in six ecosystems, four in the dry series and two in the moderately moist. Thus the wide tolerance of *Carex rupestris* on the moisture and coverage gradients, noted at Mesters Vig, is amply supported by observations elsewhere in the fjord region. Further, most of its sites described elsewhere appear to have relatively stable surficial soils as they do at Mesters Vig.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 49; HULTÉN, Circ. Pl., p. 26, map 20; POLUNIN, Circ. Fl., p. 104). It is known in the northern and in the western coastal districts of Greenland from about lat. 64°11′ to about 79°, and in the east from about 66° to about 79°12′ (BHJ., p. 255; PORSILD, l. c., map 75; GRÖNTVED, Fl. Icel., p. 155; BÖCHER, 1954, p. 135, fig. 33).

### *Carex microglochin* WAHLENB.

Common locally in wet moss-sedge meadows. Found only in dense vascular plant coverages (81–90 %), and on substrata that are stable at the surface though usually subject to mass flowage.

GELTING (1934, p. 164–5) noted this species in grassy meadows with south exposure which remained moderately damp throughout the summer. SØRENSEN (1933, p. 115) saw it on the shores of lakes and in damp grassy spots. He assigned it to a single ecosystem, in the moist to wet series (1937, p. 138): Seasonally submerged alluvial meadows. The Mesters Vig sites are on slopes, and more like those suggested by GELTING's notes.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Circumpolar, though with a much disrupted range (PORSILD, Ill. Fl., p. 49; HULTÉN, Amph. Pl., p. 232, map 214). In Greenland it reaches northward on the west coast from lat. 60° to about lat. 72°, and on the east coast it extends approximately between lats. 61° and 77°30′ (BHJ., p. 265–6; PORSILD, l. c., map 76).

### *Carex ursina* DEWEY

Found in the high tide zone on protected sandy sea beaches. Not common, mainly because of the generally poor development of sea strand vegetation in the Mesters Vig district. Where found it was in open vegetation, with coverage of 6–10%, growing on sites subject to tidal and ice action.

Noted in similar habitats throughout the fjord region by GELTING (1934, p. 177) and SØRENSEN (1933, p. 125; 1937, p. 115).

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 49; HULTÉN, Circ. Pl., p. 192, map 181; cf. also POLUNIN, Circ. Fl., p. 105). In Greenland it is known in the western coastal areas approximately between lats. 66° and 72°, and in the east between Scoresby Sund and lat. 77°30′ (BHJ., p. 254; PORSILD, l. c., map 77).

### *Carex maritima* GUNN.

*Carex incurva* LIGHTF.

Locally common in damp sand or turf. Found on moist turfy ledges among the trap ridges, and in damp sand among degrading turf hummocks along the Labben shore of Noret. In the moisture gradient it was seen only in more or less median situations, and likewise in the coverage gradient (noted in vascular plant coverages of 11–20% and 61–70%). Most of the surficial soils in which it was growing appeared relatively stable, though some of the damp sands retain their moisture throughout the summer, and probably are rather intensively frost heaved in autumn.

Observations on the habitat of this species made elsewhere in the fjord region by SØRENSEN in 1933 (p. 111) and GELTING in 1934 (p. 160–1) are generally consistent with the above. SØRENSEN in 1937 (p. 114) made a notable addition, however, by listing the species in the moist to wet ecosystem: Solifluction clay. This indicates that it is not limited to sandy soils, and lends support to the suggestion derived from the Mesters Vig notes that it can survive considerable frost heaving. Mention should be made also of GELTING's note that he found it surviving partial burial by drifting sand.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 50; HULTÉN, Circ. Pl., p. 48, map 41; POLUNIN, Circ. Fl., p. 103). In Greenland it appears to be known in all of the major coastal districts except the southeast (BHJ., p. 252; BÖCHER, 1954, p. 239, fig. 64). According to GRÖNTVED (Fl. Icel., p. 161), it extends southward on the east coast to about lat. 68°15′.

### *Carex Lachenalii* SCHK.

*Carex bipartita* ALL.

Common on the damp gravelly or mossy shores of small shallow lakes, and in wet moss-sedge meadows. It appears able to survive considerable desiccation, for many of the shallow pools around which it grows in the gravelly ancient delta remnants become dry in many summers. Also it is sometimes found on disintegrating turf hummocks which are subject to desiccation in summer. It was usually noted in open vegetation (vascular plant coverages of less than 1% to 10%) but in some meadows it was in coverages of 61–90%). Apparently it has some capacity to live through disturbance to its roots, for it was found on the borders of active sorted nets, in moderately active non-sorted silt circles, in debris islands, and on the slumping fronts of large till gelifluction lobes.

Observations of this species elsewhere in the fjord region are consistent with the above, so far as its behavior on the moisture and coverage gradients is concerned (SØRENSEN, 1933, p. 113–14; 1937, p. 137; GELTING, 1934, p. 161–2). But the data are not sufficient for analysis of its relation to the disturbance factor.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 51; HULTÉN, Circ. Pl., p. 50, map 44; POLUNIN, Circ. Fl., p. 102—3; GRÖNTVED, Fl. Icel., p. 159–60). In Greenland it ranges throughout the south-

erly coastal districts, northward in both the west and the east to about 74°30′ (BHJ., p. 253; PORSILD, l. c., map 80; GRÖNTVED, l. c.).

### *Carex amblyorhyncha* KRECZ.

Not collected in the vicinity of Tunnelelv or the Nyhavn and Labben peninsulas, but found by GUDMUNDSSON and BJÖRNSSON (Herb. H.R.) near Ekspeditionshus, in Mesters Vig (bay). It was also found at Ella Ø by our field party. Presumably the Mesters Vig plant is ssp. *pseudolagopina* (TH. SØR.) BÖCHER (cf. BÖCHER, 1952A).

Subspecies *pseudolagopina* was described by SØRENSEN as a species from Northeast Greenland material (1937, p. 167–9). He noted its habitat as "mossy cyperaceous swamps, drying out more or less in summer, on mineral soil around shallow-watered lakes, and at their outlets on raised strandflats." He also noted it in swamps near the sea shore where conditions were slightly halophytic, and where it was associated with *Carex subspathacea.*

Hemicryptophyte, usually densely caespitose though less so when growing in closed vegetation; fibrous adventitious roots (SØRENSEN, l. c., p. 168; BÖCHER, l. c., p. 22).

Geographic distribution: Circumpolar, probably with disruptions in some parts of its range (PORSILD, Ill. Fl., p. 51; HULTÉN, Circ. Pl., p. 68, map 59; BÖCHER, l. c., p. 27, fig. 12). It appears to be rather common on both east and west coasts of Greenland, in mid-latitudes. In the west it extends approximately between lats. 67° and 71°, and in the east from about 70°40′ to about 74°10′ (BHJ., p. 253; BÖCHER, l. c., p. 26, fig. 11).

### *Carex bicolor* ALL.

This species was not seen in the Mesters Vig study area in the vicinity of Tunnelelv or on the Nyhavn and Labben peninsulas, but it was found near Ekspeditionshus by GUDMUNDSSON and BJÖRNSSON (Herb. H. R.).

Noted as rare in the fjord region by both SØRENSEN (1933, p. 109) and GELTING (1934, p. 159). The former found it in damp sand, mostly on lake and river banks, and the latter at the "edge of a moor." Among his ecosystems (1937, p. 138), SØRENSEN placed it in the moist to wet series, in Seasonally submerged alluvial meadows.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar, but probably with a disrupted range in northern Eurasia (PORSILD, Ill. Fl., p. 52; HULTÉN, Circ. Pl., p. 38, map 31). Its range in Greenland is apparently discontinuous, extending on the west coast from about lat. 60° to 71°45′. On the south-

east coast it has been found at about lat. 68°15′, and in the fjord region of the northeast coast between 72°45′ and 73°30′ (BHJ., p. 257; BÖCHER, 1954, p. 239, fig. 64; PORSILD, l. c., map 83).

### *Carex Bigelowii* TORR.

*Carex rigida* GOOD.

One of the most abundant sedges in the district, and found in a great variety of habitats ranging from dry to wet, unstable to stable, and with both open and closed vegetation. It is probably most abundant in wet moss-sedge meadows, hummocky meadows, turf hummocks, and in both heath and sedge-grass tundra on moist mountain slopes. However, it is common also on dry, stony till knolls, in barely damp depressions in the tops of trap knobs and ridges, or on the otherwise dry gravelly surfaces of the ancient delta remnants. Occasionally it is found in drier sites, such as upper sandy sea beaches beyond reach of high tides, where its substratum is being blown out by the wind, or in areas of depositing, wind-blown sand on the tops of the delta remnants, or on steep, southeast-facing bluffs of loose sand in the delta remnants. It has been seen in all vascular plant coverage categories from 1 % to 90 %. Its ability to survive burial by blowing sand, or slow deflation of its sandy substratum by wind, and to some extent the dry creep of its substratum, has already been mentioned. It was also seen on the active surfaces, fronts, and lower lateral margins of small silt gelifluction lobes, and at the borders of sorted nets.

Earlier observations in the fjord region have emphasized the abundance of this species, and have noted a large measure of its wide tolerance in the moisture gradient. They also suggest a considerable range in the coverage gradient, but have little to say about the relation of the species to physical disturbance. GELTING (1934, p. 170–71) found it in most plant associations, but most abundantly in xerophilous grass heaths and in bogs. He noted that it sometimes penetrates far into snowpatches, and stated specifically that it had a wide amplitude in the moisture scale. Apparently neither OOSTING (1948, p. 251, 253) nor SØRENSEN (1933, p. 120–21; 1937, p. 114) saw it in the drier sites, for they placed it in wet meadows or other forms of damp ground vegetation. SØRENSEN listed it in four ecosystems, all in the moderately moist and moist to wet series, and all with relatively dense cover.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Included by HULTÉN among the circumpolar species (Circ. Pl., p. 50, map 43; cf. also Amph. Pl., p. 11; POLUNIN, Circ. Fl., p. 101–02). PORSILD (Ill. Fl., p. 52) regarded it as amphi-

Atlantic, basing this range upon the recognition of *C. consimilis* HOLM and *C. lugens* HOLM as valid specific segregates in northwestern America and eastern Asia. Both are very closely related to the polymorphic *C. Bigelowii*. In Greenland the species has been found in all the coastal districts except the north (BHJ., p. 259–60; PORSILD, l. c., map 84).

### ***Carex subspathacea*** WORMSK.

Occasional on the mossy shores of small shallow lakes, and on upper sandy sea beaches within reach of high tides. Found only in very low vascular plant coverages. On sea beaches it probably withstands considerable physical disturbance due to tidal and ice action.

Observations elsewhere in the fjord region by GELTING (1934, p. 175–76) and by SØRENSEN (1933, p. 123–24; 1937, p. 114) are in substantial agreement with the above. SØRENSEN noted that the species is found in mineral soils as well as organic ones.

Geophyte, with horizontal rhizomes and fibrous adventitious roots (GELTING, 1934, p. 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 54; HULTÉN, Circ. Pl., p. 194, map 184; Amph. Pl., p. 12). In Greenland it is known in all the southerly coastal districts, northward in the west to about lat. 72°, and in the east to about 76°49′ (BHJ., p. 258; PORSILD, l. c., map 87; GRÖNTVED, Fl. Icel., p. 176–77).

### ***Carex norvegica*** RETZ. ssp. ***inserrulata*** KALELA

*Carex alpina* SW., in part.
*Carex Vahlii* SCHK., in part.

Found only once in the Mesters Vig district, in a wet, hummocky meadow near experimental site 8, in the Nyhavn hills. There it was in dense vascular plant coverage (81–90 %) in a relatively stable substratum.

Also noted as rare by both SØRENSEN (1933, p. 108) and GELTING (1934, p. 158). The former observed it in damp grass and dwarf shrub vegetations, and the latter in moderately damp meadows or dry grassy moors and heaths. SØRENSEN listed it in only one, moist to wet, ecosystem (1937, p. 136): Earth glaciers and sliding slopes. OOSTING (1948, p. 258) listed it on loose dry gravel slopes, suggesting, as did GELTING, that it has a rather wide range in the moisture gradient, and probably also in that of coverage.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: HULTÉN (Amph. Pl., p. 92, map 74) regards *C. norvegica* as an amphi-Atlantic species, in which ssp. *inserrulata*

occurs in northeastern America, West Greenland, and Northeast Greenland; the typical form is in northwestern Europe, Iceland, south and southeast Greenland; and ssp. *conicorostrata* isolated in extreme eastern Siberia. Subspecies *inserrulata* is known on the west Greenland coast northward to about lat. 74°, and on the east coast approximately between lats. 68°30′ and 74° (BHJ., p. 261; PORSILD, Ill. Fl., p. 54, map 88).

### ***Carex supina*** WAHLENB. ssp. ***spaniocarpa*** (STEUD.) HULTÉN

Common in loose, dry stony grus on the tops and upper slopes of trap knobs and ridges. It also colonizes sliding grus in talus slopes. The only other kind of site in which this species was seen was on the fronts and lower margins of small, relatively inactive silt gelifluction lobes. In such places it was sometimes in rather dense vegetation, 50–60 % coverage by vascular plants, in soils that probably were moist for a time in spring but dry in summer. In loose grus it was in cover ranging from 1 % to 20 %, sometimes in an extremely unstable substratum.

SØRENSEN (1933, p. 124) noted this species in dry places open to the wind, growing in coarse loose sand, and GELTING (1934, p. 176–77) thought it grew exclusively in loose dry sand of aeolian origin or on gravelly soil exposed to the winds. SØRENSEN (1937, p. 114) restricted it to a single ecosystem embracing many of these habitats: Disintegrating summits and crests. Its presence on the fronts of the small silt gelifluction lobes at Mesters Vig, therefore, extends the range of its site tolerance to some extent.

Geophyte with horizontal rhizomes and fibrous adventitious roots (GELTING, 1934, p. 296).

Geographic distribution: Primarily a North American subspecies of a circumpolar type, extending from East Greenland westward to the Lena River region of Siberia (HULTÉN, Fl. Al., p. 365; Circ. Pl., p. 188, map 178; PORSILD, Ill. Fl., p. 55, map 90). In Greenland it is known on the west coast approximately between lats. 64° and 74°, on the southernmost coasts, on the northeast from Scoresby Sund north to about lat. 77°30′, and at a few stations on the southeast coast (BHJ., p. 256; PORSILD, l. c.; BÖCHER, 1954, p. 189, fig. 51; SEIDENFADEN & SØRENSEN, 1937, p. 85, fig. 30).

### ***Carex glacialis*** MACK.

*Carex pedata* WAHLENB.

Occasional on the drier sites, such as gravelly talus slopes, sandy knolls in the ancient delta remnants, loose stony grus on the tops and upper slopes of trap knobs and ridges, and upper sandy sea beaches beyond the reach of high tides. It was found in fairly moist sandy soils

on the Myggesø slopes watered during the summer by melting snowdrifts and thawing ground. In the vascular plant coverage gradient it was seen only in low densities (less than 1 % to 20 %). Most of the surface soils in which it was seen had good internal drainage and were relatively stable, though the beach sands were subject to some wind displacement. It was also seen in the nearly barren centers of large polygons bordered by ice-wedge cracks (experimental site 20).

GELTING (1934, p. 169) found this species to be very rare in the central areas of the fjord region, and saw it only on hard, dry clay. SØRENSEN, working in the southern area (1933, p. 118), gave its habitat as highly desiccated solifluction soil. Later, however, when he arranged the species of the northern areas in ecosystems (1937, p. 114), he placed *Carex glacialis* on the moist to wet Earth glaciers and sliding slopes. Taken together, therefore, these observations indicate that the species has wider tolerances in the moisture and coverage gradients than the Mesters Vig notes suggest. They gave no more indication than the latter notes, however, that it can survive much physical disturbance.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar, probably with a disrupted range in northern Eurasia (PORSILD, Ill. Fl., p. 56; HULTÉN, Circ. Pl., p. 30, map 23; POLUNIN, Circ. Fl., p. 102). On the west coast of Greenland it extends from near the southern end to about lat. 73°30′, while on the east coast it reaches from about lat. 66° to about lat. 75° (BHJ., p. 257; PORSILD, l. c., map 91; GRÖNTVED, Fl. Icel., p. 165; BÖCHER, 1954, p. 135, fig. 33).

### *Carex rariflora* (WAHLENB.) SM.

Found only once in the Mesters Vig district, in a saturated moss-sedge meadow on the shore of a small lake among the Nyhavn hills. It was in dense vascular plant cover (81–90 %), on a relatively stable turf substratum.

Judging by observations made elsewhere in the fjord region the habitat noted above is a typical one for this species, but it also grows in "bogs" (GELTING, 1934, p. 169–70; SØRENSEN, 1933, p. 118–20, 1937, p. 136, 138; OOSTING, 1948, p. 255). In terms of SØRENSEN's ecosystems the Mesters Vig site in which the species was found is his "Water-soaked ground." He also listed it in "Knolly bogs," the counterpart of "turf hummocks" as the latter term is used here. These notes suggest that the species has a small range of tolerance in the moisture scale, and is not restricted to saturated meadows.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 56; HULTÉN, Circ. Pl., p. 14, map 8). On the west coast of Greenland it is known from lat. 60° northward to about lat. 73°, while on the east coast it is found northward from lat. 60° to about lat. 66°, and then from the Scoresby Sund district to about lat. 74°30′ (BHJ., p. 262–63; PORSILD, l.c., map 92; GRÖNTVED, Fl. Icel., p. 172).

### *Carex atrofusca* SCHK.

Occasional in the Mesters Vig district, where it is usually found in wet, moss-sedge meadows though it sometimes appears also in heath tundra on damp mountain slopes. It was seen mostly in rather dense vegetation, with vascular plant coverages of 81–90 %, but occasionally in more open stands (51–60 %). Its surficial substrata were apparently stable, though in some cases subject to mass wasting.

Observations made by others on this species in the fjord region are consistent with the above, although it is obviously more common in some places than it is at Mesters Vig (GELTING, 1934, p. 158–59; SØRENSEN, 1933, p. 108–09; OOSTING, 1948, p. 251). SØRENSEN (1937, p. 114) listed it in two of his moist to wet ecosystems: Earth glaciers and sliding slopes, and Water-soaked ground.

Geophyte, with horizontal non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 56; HULTÉN, Circ. Pl., p. 46, map 39). Its range in the Greenland coastal areas appears to be somewhat broken. In the west it is known in the north at about lat. 71°, and then from about lat. 72°30′ southward to Disko Bugt and Disko. On the east coast it has been found from Scoresby Sund north to about lat. 77°30′ (BHJ., p. 263; PORSILD, l.c., map 94; GELTING, 1934, p. 158–59).

### *Carex misandra* R. BR.

Common in wet moss-sedge meadows, in hummocky wet meadows, on both growing and deteriorating turf hummocks, and in heath tundra on moist mountain slopes. It is also found occasionally in drier sites such as steep dry ledgy slopes, and on the ancient gravel river terraces near the mouth of Tunnelelv. In the scale of vascular plant coverage it occurs in areas with less than 1 %, and appears in most of the categories between this and 81–90 %. It grows in damp sandy or silty soils as well as in turf, and seems able to withstand a great deal of physical disturbance. It is common on the most active surfaces, fronts and lower margins of small, silt gelifluction lobes, and is found in the active silt centers of sorted nets. It grows in the actively moving surface soils of the large

till gelifluction lobes on the mountain slopes, and at low altitudes it appears as a weed in the disturbed soils around habitations.

The wide tolerance of this species in the scales of moisture and coverage has been noted by other observers in the fjord region, and evidence of its ability to withstand disturbance has also been recorded. GELTING (1934, p. 165–66) mentioned it as very common in bogs, meadows and heaths, and noted that it had a "wide amplitude" in the moisture scale. SØRENSEN stated in 1933 (p. 115–16) that it grew everywhere except in the driest and most swampy places, and that it appeared most luxuriant on mineral soil. But in 1937 (p. 114) he listed it in one of his driest ecosystems: Barren ground, as well as in one of the wetter ones: Constantly irrigated fields. OOSTING (1948, p. 251, 259) also saw this contrast, noting the species in pond margin meadows and on dry sandy slopes. SØRENSEN (1937, p. 114) noted it in "Solifluction clay" which, judging by his description, was actively frost heaved soil.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 56–57; HULTÉN, Circ. Pl., p. 20, map 14; POLUNIN, Circ. Fl., p. 103). Its range in Greenland is around the northern coastal areas, reaching southward in the west to about lat. 65°, and in the east to about lat. 68° (BHJ., p. 263; PORSILD, l.c., map 95; SEIDENFADEN & SØRENSEN, 1937, p. 195, fig. 57).

### *Carex capillaris* L.

Common in habitats ranging from wet to relatively dry, and from open to closed cover. It is found in wet moss-sedge meadows, hummocky wet meadows, on turf hummocks, and in heath tundra on moist mountain slopes. But it is also not uncommon on dry stony till knolls, and in loose stony grus on the tops and upper slopes of trap knobs and ridges. It was seen in vascular plant coverages ranging from about 10 % up to about 90 %. Apparently it is able to survive considerable physical disturbance, for it grows on the active surfaces, fronts and lower margins of small silt gelifluction lobes. The Mesters Vig plants represent the typical species.

GELTING (1934, p. 159–60) noted the habitat of this species as moderately moist soil in bogs and meadows, rarely on pure mineral ground, and SØRENSEN in 1933 (p. 109–10) said that it preferred the most luxuriant grass and dwarf shrub vegetations. He listed it in a single, moderately moist ecosystem (1937, p. 114): Fronts of earth glaciers. On the other hand, it is noted specifically by OOSTING only on loose dry gravel slopes and on dry sandy slopes (1948, p. 258, 259). Thus taken together these earlier observations indicate wide

tolerances in the moisture and coverage gradients similar to those seen at Mesters Vig.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 58; HULTÉN, Circ. Pl., p. 54, map 47; GRÖNTVED, Fl. Icel., p. 163–64). It is known in most of the coastal areas of Greenland except the north. In the west it extends north to about lat. 78°45′, and in the east to about 77°40′ (BHJ., p. 263–65; PORSILD, l. c., map 97; GRÖNTVED, l. c.).

### *Carex saxatilis* L.

Common to abundant in saturated moss-sedge meadows, or sometimes in the shallow water on the marshy shores of small shallow lakes, growing in sandy soil or turf. Where found it was usually in dense vascular plant coverages (81–90 %) and in soils that were surficially stable though in some cases subject to mass flowage.

Notes made by others on the habitat of this species in the fjord region are in general consistent with the above. However, both SØRENSEN (1933, p. 122) and GELTING (1934, p. 171–72) point out that the lakes and ponds around which it grows sometimes dry up, leaving it in essentially dry soil by late summer. Thus it shows capacity to survive a great deal of desiccation. SØRENSEN (1937, p. 114) listed it in a single ecosystem: Water-soaked ground.

Geophyte, with horizontal, non-tuberous rhizomes and fibrous adventitious roots (GELTING, 1934, p. 297).

Geographic distribution: Circumpolar, though with a gap in its range in the Beringian region (PORSILD, Ill. Fl., p. 58–59; HULTÉN, Circ. Pl., p. 22, map 16; GRÖNTVED, Fl. Icel., p. 175). It is known on the westerly coastal areas of Greenland from the southern tip to lat. 76°30′. Its northern limit on the east coast is given by SEIDENFADEN & SØRENSEN (1937, p. 84) as 77°40′, and it is implied by them that the species is more or less continuous from lat. 60° to this point. However, more recent writers (PORSILD, l. c., maps 99, 100; BHJ., p. 266) leave a gap approximately between lat. 63° and lat. 72°.

### *Juncus trifidus* L.

Found in the Mesters Vig district thus far only on rather steep, dry, grassy slopes, where it was not common. The vascular plant coverage was 20–30 %, and the soil rather loose and sandy. The slopes were steep enough to cause sliding of loose exposed mineral soil.

Earlier observers in the fjord region have made no comments on the habitat of this species, which is much more common on the East Greenland coast from Scoresby Sund southward. BÖCHER (1938, p. 246–48) summarized its habitat in the northern part of this range as herb fields and rich *Empetrum-Vaccinium* heaths.

Hemicryptophyte, with branched rhizomes and fibrous adventitious roots (cf. BÖCHER, l. c.).

Geographic distribution: Amphi-Atlantic (PORSILD, Ill. Fl., p. 62; HULTÉN, Amph. Pl., p. 46, map 28). In Greenland it is known in all the southerly coastal districts, northward in the west to the Nûgssuaq peninsula, and in the east at least to the Mesters Vig district, at about lat. 72°12′ (BHJ., p. 230; PORSILD, l. c., map 107).

### ***Juncus biglumis*** L.

Common to abundant in wet meadows, hummocky wet meadows, and in shallow water at the sandy or moss-sedge shores of small lakes. Although most abundant in these wet habitats, the species is also found in merely damp sandy or silty soils, and even in the dry blowing sand of upper sea beaches beyond the reach of high tides. In the scale of vascular plant coverage it was found in densities ranging from less than 1 % to 90 %. In wet meadows, heath and sedge tundra it grows in surficial soils that are essentially stable though often subject to mass flowage, but it was found also on the surfaces, fronts, and lower lateral margins of small active, silt gelifluction lobes, and on the actively moving soil on the top surfaces of large till gelifluction lobes. Its capacity to survive disturbance is shown, too, by its appearance in the duned sand of the upper beaches, and by growing as a weed in the disturbed soil around habitations.

There is evidence in earlier notes for much of the above range of tolerance in the coverage gradient, and a part of that in the moisture gradient, but there is little to suggest the relationship of the species to physical disturbance. GELTING (1934, p. 215) saw it in damp sandy or clayey soil, in bogs, and along streams. SØRENSEN (1937, p. 115) summarized his habitat notes for it by listing it in four ecosystems, all in the moist to wet series. OOSTING (1948, p. 251, 252, 254–55) noted it in wet meadows and in wet alluvial sands.

Hemicryptophyte, the stems rising singly, or very loosely caespitose; fibrous adventitious roots (GELTING, 1934, p. 215, 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 61–62; HULTÉN, Circ. Pl., p. 44, map 37; POLUNIN, Circ. Fl., p. 116). It is known in all the coastal districts of Greenland (BHJ., p. 232; PORSILD, l. c., map 105).

### *Juncus triglumis* L.

*Juncus triglumis* L. var. *Copelandi* BUCHEN of auth.

Occasional to common in saturated moss-sedge meadows, hummocky wet meadows, on turf hummocks, and in heath tundra on moist mountain slopes. Although it grows under a considerable range of conditions on the moisture gradient, from saturated sites to upland silty soils that may become only damp at the surface in late summer, it does not seem to have as wide a tolerance in this respect as *J. biglumis*. It was found in various coverage densities (11–20 %, 51–60 %, and 81–90 %). That it can survive a certain amount of physical disturbance is shown by its presence on the fronts and lower lateral margins of small, active silt gelifluction lobes. Here again its tolerance appears not to be as great as that of *J. biglumis*, for it was not seen on the more active surfaces of these lobes. *Juncus triglumis* as interpreted here includes *J. albescens* (LANGE) FERN., which is considered by some students to be a separate species of North America and Greenland (PORSILD, Ill. Fl., p. 62, map 106; for discussions cf. HULTÉN, Fl. Al., p. 431–32; JSW., p. 47–48; SEIDENFADEN & SØRENSEN, 1937, p. 166).

Earlier habitat notes made in the fjord region, taken together, are consistent with those at Mesters Vig. GELTING found the species only in damp soil among moss (1934, p. 216), but SØRENSEN (1933, p. 159–61) saw it on moist to wet grassy slopes, especially where the ground water was in motion. He placed it in a single, moist to wet ecosystem (1937, p. 115): Earth glaciers and sliding slopes.

Hemicryptophyte, culms usually rising singly, or sometimes loosely caespitose; fibrous adventitious roots (GELTING, 1934, p. 216, 295).

Geographic distribution: Circumpolar (HULTÉN, Circ. Pl., p. 48, map 42; POLUNIN, Circ. Fl., p. 116). It is known in all the major Greenland coastal districts, though it appears to be rare and scattered on the southeast coast (BHJ., p. 232; PORSILD, l. c.).

### *Juncus castaneus* SM.

Occasional or locally common in saturated moss-sedge meadows and hummocky wet meadows (inter-hummock areas). It is sometimes found in moist heath tundra, and on the surfaces, fronts, and lower lateral margins of small, active, silt gelifluction lobes. Thus it is able to survive a certain amount of desiccation, especially in late summer on the silts, and a considerable amount of disturbance in its substratum. It was found in vascular plant coverages of 11–20 %, 51–60 %, and 81–90 %.

The above habitat notes are consistent with those made elsewhere in the fjord region. The wet meadows and mossy ground, and damp

sandy shores are emphasized by GELTING (1934, p. 215–16) and SØRENSEN (1933, p. 159; 1937, p. 115). These sites were also noted by OOSTING, but it is of interest that he also saw the species in new and very unstable morainic soil at the edge of a pond that was in contact with glacial ice (1948, p. 258).

Hemicryptophyte, with culms rising singly or loosely caespitose; fibrous adventitious roots (GELTING, 1934, p. 215–16, 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 61; HULTÉN, Circ. Pl., p. 28, map 22; POLUNIN, Circ. Fl., p. 116). Its range on the west coast of Greenland is between lats. 62°30′ and 76°, and on the east coast between lats. 70° and 78°, with an isolated station at Angmagssalik (BHJ., p. 232).

### *Luzula arctica* BLYTT

*Luzula nivalis* (LAEST.) BEURL.

Occasional to common in wet moss-sedge meadows, hummocky wet meadows, on turf hummocks, and in heath tundra on moist mountain slopes. It is also found in sandy soils kept moist during the summer by water from melting snow and thawing ground. Though most common in vascular plant coverages of 60 % to 90 %, it was noted also in open cover (less than 1 % and 11–20 %). In most of its sites the surficial soils are relatively stable though subject to mass flowage. However, it was found also in the active centers of sorted nets, and in the actively moving soils on the tops of large till gelifluction lobes on the mountain slopes. Thus it can survive a great deal of disturbance to its root systems.

SØRENSEN (1937, p. 115) listed this species in five ecosystems, one of them (Well-drained fields) in the moderately moist series, and the other four in moist to wet. The latter contain a variety of coverage and moisture types, such as Sheltered sunny slopes, Snow-patches and polygon fields, and Constantly irrigated fields. GELTING (1934, p. 217–18) also restricted the species to damp soil, and likewise allowed it a wide range in the coverage gradient. Little can be gained from these notes, except by inference, about its relationship to the disturbance factor.

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 62; HULTÉN, Circ. Pl., p. 10, map 4; POLUNIN, Circ. Fl., p. 119). In Greenland it is found in all the northerly coastal districts, southward in the west to about lat. 66°30′, and in the east to Scoresby Sund (BHJ., p. 236; PORSILD, l. c., map 109; BÖCHER, 1952, p. 59, fig. 29).

### *Luzula spicata* (L.) DC.

Occasional or locally common. It is most frequently seen on moist sites, though it also occurs on relatively dry ones. Found in hummocky wet meadows, on turf hummocks, and in heath or sedge tundra on moist mountain slopes. It is common on damp sand at the shores of small shallow lakes, but also occurs in dry stony-sandy soil on south-facing ledges among the trap and sandstone hills. The vascular plant coverages in which it appeared were of medium to high densities (31–40 % and 71–90 %). The surficial soils in most of its habitats are relatively stable though some are subject to mass flowage. However, it was found on the active surface of one small, silt gelifluction lobe, suggesting that it is able to withstand a certain amount of physical disturbance. A further suggestion of this comes from its presence as a weed in the disturbed soils around habitations.

GELTING (1934, p. 218) noted a range of tolerance in the moisture gradient for this species somewhat similar to the above when he found it on sites from "moderately damp to highly desiccating, nearly always with south exposure." SØRENSEN, however, placed it in a single, moderately moist ecosystem: Herb mats on sheltered sunny slopes (1937, p. 137).

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar, with a much disrupted range (HULTÉN, Amph. Pl., p. 236, map 218; PORSILD, Ill. Fl., p. 63). In Greenland it is southern, known in all the southerly coastal districts, reaching northward in the west to about lat. 72°30′ and in the east to about 74°30′ (BHJ., p. 235–36; PORSILD, l. c., map 110).

### *Luzula confusa* LINDEB.

*Luzula arcuata* (WAHLENB.) SW. var. *confusa* (LINDEB.) KJELLM.

Common throughout the Mesters Vig district on a great variety of sites, but probably most frequent in the drier parts of the moisture gradient. It is found on the dry gravelly tops of the highest ancient delta remnants, as well as on sandy knolls, areas of sand deposition, and on steep northwest- and southeast-facing slopes in the delta remnants. It grows in loose stony grus on the tops and upper slopes of trap knobs and ridges, on dry stony till knolls, and on the old sand and gravel terraces near the mouth of Tunnelelv. On the other hand, it is also common in sandy soils kept damp through the summer by water from melting snow and thawing ground, and it occurs also in hummocky wet meadows, on turf hummocks, and in heath tundra on moist mountain slopes. It

is found in vascular plant coverages ranging from less than 1 % to 90 %, and appears able to withstand a great deal of physical disturbance to its root system. This is suggested by its presence in the blowing sand of the upper sea beaches above the reach of high tides, in debris islands, at the borders of the active materials in sorted nets, and on the active surfaces of small silt gelifluction lobes. Likewise it survives in the actively moving surface soils on the tops of large till gelifluction lobes on the mountain slopes. It grows as a weed in the disturbed soils around habitations.

Earlier observations of this species in the fjord region bring out nearly all of its wide tolerances in the moisture and coverage gradients, though they do not do justice to its ability to survive disturbance. GELTING (1934, p. 217) saw it in a large number of plant associations, in damp as well as dry soil, though he found it most frequent in dry soil. SØRENSEN in 1933 (p. 161–62) wrote that it occurred nearly everywhere except in the driest places most exposed to the wind. Later he listed it in no less than seven ecosystems ranging from the driest (Barren ground), through moderately moist, and into moist to wet (1937, p. 115). He did not mention it, however, on sites that can be interpreted as having actively disturbed surficial soils.

Hemicryptophyte, densely caespitose, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 63; HULTÉN, Circ. Pl., p. 22, map 15; POLUNIN, Circ. Fl., p. 119). It is known in all the coastal districts of Greenland (BHJ., p. 236; PORSILD, l. c., map 111).

### ***Luzula frigida*** (BUCHEN.) SAM.

*Luzula multiflora* (RETZ.) LEJ. ssp. *frigida* (BUCHEN.) KRECZ.

Occasional in wet hummocky meadows and on turf hummocks. Also found in slumping turf on the fronts of large till gelifluction lobes. It was seen only in vegetation with relatively dense vascular plant coverage (61–90 %), on relatively stable turfy soils subject to mass flowage.

This species comes into the fjord region only at the south, and earlier observers have made no comments on its habitat. BÖCHER (1938, p. 248–49) summarized its habitats in the southern half of Greenland as "scrub, herb fields, south-exposed heaths."

Hemicryptophyte, with fibrous adventitious roots (cf. BÖCHER, l. c.).

Geographic distribution: Circumpolar (HULTÉN, Circ. Pl., p. 72, map 64; SEIDENFADEN & SØRENSEN, 1937, p. 180). It is southern in Greenland, extending northward on the west coast to about lat. 71°30′,

and on the east at least to the Mesters Vig district (lat. ca. 72°12′) with some apparent gaps on the southeast coast (BHJ., p. 237; Böcher, 1950, p. 20, fig. 5).

### *Tofieldia pusilla* (Michx.) Pers.

*Tofieldia palustris* Huds.
*Tofieldia minima* (Hill) Druce

Occasional to common; most frequently found in moss-sedge meadows, hummocky wet meadows, and on both developing and deteriorating turf hummocks. It also grows in heath tundra on moist slopes, and in the dry heaths on the gravelly ancient delta remnants. On these delta remnants it was found in areas of depositing sand back of steep windward slopes. Other dry sites occupied by it are on steep, ledgy, south-facing slopes with loose sandy soils and a partial cover of heaths, grasses and sedges. In the vascular plant coverage gradient it was seen only in higher densities, 51–60 % and 71–90 %. Apparently it can withstand a certain amount of disturbance in the surface soils, though not much. It was found on the fronts and lower lateral margins of small silt gelifluction lobes, but not on their more active surfaces. The surface soils of the meadow sites may be subject to mass flowage, but appear to be fairly stable in themselves.

Notes on the habitat of this species made by others in the fjord region are fairly consistent with most of those at Mesters Vig. Gelting, (1934, p. 219–20) found it in bogs or damp heaths, more rarely on bare mineral soil, and Sørensen (1933, p. 164–5) noted it in bogs and damp dwarf shrub vegetations. Oosting (1948, p. 252–3) saw it in maturing moss mat vegetation and on moss hummocks. Sørensen (1937, p. 137) listed it in his "Knolly bog" ecosystem. The Mesters Vig observations appear to extend the tolerance of the species considerably farther into the drier part of the moisture gradient than these earlier notes would have permitted.

Hemicryptophyte, loosely caespitose, with fibrous adventitious roots (Gelting, 1934, p. 295).

Geographic distribution: Circumpolar (Porsild, Ill. Fl., p. 64; Hultén, Circ. Pl., p. 40, map 33; Polunin, Circ. Fl., p. 123). The species is southern in Greenland, reaching northward in the west to about lat. 74°, and in the east to about lat. 74°30′ (BHJ., p. 222; Porsild, l. c., map 112).

### *Salix herbacea* L.

Common locally, in hummocky moss-sedge meadows, damp sandy depressions in the tops of the ancient delta remnants, dry sandy knolls, and in the duned sand of upper sea beaches beyond the reach of high

tides. Thus it lives under a wide range of conditions on the moisture gradient; and likewise on the vascular plant coverage gradient, for it was seen in coverages ranging from 1 % or less to as great as 90 %. Most of its habitats have relatively stable surficial soils, but in the beach sands it is subject to being blown out or partially submerged.

The Mesters Vig observations give this species a considerably wider range on the moisture gradient and probably also on the disturbance gradient, than is found in notes made elsewhere in the fjord region. SØRENSEN (1933, p. 73–4) and GELTING (1934, p. 115–16) both observed it in snow-patches, and the latter sometimes in *Cassiope* heaths. SØRENSEN in 1937 (p. 113) placed it in a single ecosystem in the moist to wet series: Sheltered sunny slopes and patches. OOSTING (1948, p. 251) saw it only on moss hummocks.

Chamaephyte, with ligneus taproot and underground runners (GELTING, 1934, p. 290).

Geographic distribution: Amphi-Atlantic, extending westward to Great Bear Lake, and eastward to northwestern Asia (PORSILD, Ill. Fl., p. 65; 1958, map 5; HULTÉN, Amph. Pl., p. 42, map 24). In Greenland it is widespread in the eastern and western coastal districts, but apparently not in the north. It reaches northward on both coasts to about lat. 78° (PORSILD, l. c., map 114; BÖCHER, 1954, p. 111, fig. 28; RAUP, 1959, p. 11, map 6).

### *Salix arctica* PALL.

One of the most abundant and ubiquitous vascular plants in the Mesters Vig district. A list of the kinds of sites in which it was found becomes merely a list of nearly all of the kinds that were examined. Of approximately 180 sites in which the flora was studied in more or less detail, *Salix arctica* was noted in 145. It is perhaps more to the point to mention the few kinds of places in which it was not found. On the sea beaches, although common in the duned sand at higher levels, it was found at no point that was within reach of tides. It was not seen on some of the more active river gravels in the beds of the larger mountain streams such as Tunnelelv, where the flora is reduced to a single species (*Epilobium latifolium*). It does not grow in the standing water of lakes, though it seems able to survive submergence for a time, and in saturated meadows its root systems must be in free water nearly or quite throughout the open season. Although found in debris islands elsewhere, it was not seen in those developed in sandstone and shale on the summit of Hesteskoen, nor was it observed in the most barren centers of the large polygons studied at experimental site 20. It was commonly found in mixtures with all of the shrubby plants of the tundra, but it failed to

appear in some of the most dense stands of *Cassiope tetragona* on the dry tops of the ancient delta remnants.

On the moisture gradient it is found from the driest to the wettest sites short of standing water, and it was noted in all vascular plant coverage categories. It seems to have large capacity to withstand physical disturbance, as shown by its presence in most of the disturbed surface soils of the area, whether the displacement is caused by frost, wind, gravity, running water or human activity. Studies of its root and stem systems made in connection with an investigation of turf hummocks, and reported elsewhere in the present series of papers, indicate that *Salix arctica* grows most vigorously in moss-sedge meadows that are wet throughout the open season and in which low moss hummocks are formed, but in which a continuous mat of mosses remains unbroken. However, it goes on living elsewhere for many years, in spite of repeated injuries and suppressions. The oldest plant found was aged about 236 years.

The essential features in the remarkable range of tolerance exhibited by this species are found in the notes of several observers in the fjord region. SØRENSEN in 1933 (p. 72–3) found it in dry as well as damp soil, but said that it was mostly in bogs. GELTING (1937, p. 29) in his study of ptarmigan foods, wrote that it "is one of the commonest plants within the area and perhaps the commonest dwarf-shrub. It has an exceedingly great amplitude in the various ecological scales and occurs on nearly all kinds of soil from the driest to the dampest, from the deeply snow-covered to the snow-free soil . . ." He thought that, judging by its relative numbers and luxuriance, it was "rather a hygrophyte." SØRENSEN listed it in eight different ecosystems (1937, p. 113), ranging from the driest (Barren ground) to the wettest except for standing water (Fresh alluvial flats). Included in these is Solifluction clay, which is described as having disturbed surficial soils.

Chamaephyte, with ligneous stem and long ligneous taproot (GELTING, 1934, p. 289).

Geographic distribution: *Salix arctica* is here considered in a broad sense, as a circumpolar polymorphic species (PORSILD, Ill. Fl., p. 70; HULTÉN, Fl. Al., p. 513–15; POLUNIN, Circ. Fl., p. 147). Its range in Greenland as outlined by BHJ (p. 138–9), is in the northern coastal areas, coming south in the west to Disko Bugt and Disko, and in the east to Scoresby Sund.

### ***Salix arctophila*** COCK.

Apparently rare in the Mesters Vig district, and found in heath tundra on moist mountain slopes. It was in vascular plant coverages ranging from 40% to 70%, on relatively stable surficial soils.

*Salix arctophila* has not previously been recognized as occurring on the eastern coast of Greenland. However, a few plants were found in the vicinity of Mesters Vig that have leaves with many lateral veins coming off the midribs at wide angles, and the short, broad ventral glands of this species (nos. 319, 571). Others showed a partial expression of these characters (nos. 303, 386, 595, 663), but were too close to the multiform *S. arctica* to be removed from it.

Chamaephyte, with long ligneous taproot.

Geographic distribution: Arctic and subarctic America west to northeastern Alaska (PORSILD, Ill. Fl., p. 69, map 123; RAUP, 1959, p. 11, 51). Known in most of the western coastal districts of Greenland (BHJ., p. 138; PORSILD, l. c.).

### ***Betula nana*** L.

Common locally on ledges and in crevices among the trap and sandstone hills and mountain slopes. It also occurs occasionally on stony till knolls, in shallow depressions on the tops of trap knobs and ridges, and on the slumping fronts of large till gelifluction lobes. In the heath tundra of moist mountain slopes it is found mostly in rocky places. In the area of large polygons at experimental site 20 it appeared in profusion at the margins of the barren centers of the polygons. Although most common in damp tundra it was also found toward the drier end of the moisture gradient; and though most frequent in rather dense shrub cover, it was sometimes found in coverages as low as 11–20 %. The soils in its surficial substrata are relatively stable, though occasionally, as on the large gelifluction lobes, subject to mass movement.

Observations elsewhere in the fjord region are generally consistent with those at Mesters Vig. SØRENSEN (1933, p. 22–3) found the species mostly in dry, but also in damp soil. GELTING (1934, p. 31–3) noted it in heaths, grass heaths, tufts, xerophyllous heaths, and in supra-aquatic stripes. In the northern part of the region SØRENSEN placed it in a single, moderately moist ecosystem (1937, p. 112): Sheltered precipices and rock ledges.

Chamaephyte, with ligneous taproot (GELTING, 1934, p. 289).

Geographic distribution: Amphi-Atlantic (PORSILD, Ill. Fl., p. 71; HULTÉN, Amph. Pl., p. 12–13), westward in America only into southeastern Baffin Island, but eastward to between the Yenisei and Lena Rivers. Some students regard *B. nana* as an essentially circumpolar species, placing in it northwestern American plants which American students usually consider to be forms of *B. glandulosa* (cf. HULTÉN, l. c.; SEIDENFADEN & SØRENSEN, 1937, p. 171; POLUNIN, Circ. Fl., p. 151). In Greenland *B. nana* is known in the eastern coastal districts

approximately between lats. 62°30′ and 75°, and in the west between lats. 63° and 74°18′ (BHJ., p. 140; PORSILD, l. c., map 127; GRÖNTVED, Fl. Icel., p. 206–7).

### *Koenigia islandica* L.

Locally common to abundant in peatty tundra pools, but apparently not widely distributed in the Mesters Vig district. It is found in areas that have vascular plant coverages of low density, and that are wet or very moist. It is probable that many such areas are subject to intensive frost heaving.

The observations of GELTING (1934, p. 88–9) and SØRENSEN (1933, p. 50; 1937, p. 113) are consistent with those at Mesters Vig. The latter noted it in wet places comparatively destitute of vegetation, and placed it in a single ecosystem: Constantly irrigated fields.

Therophyte, with a simple or slightly branched primary root (GELTING, 1934, p. 88–9, 298).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 72; HULTÉN, Fl. Al., p. 594–5; POLUNIN, Circ. Fl., p. 154). In Greenland it is noted by BHJ (p. 142) as known in all districts from north to south, but maps of its range show no locations on the north coast (PORSILD, l. c., map 128; GELTING, 1934, p. 283, fig. 46). Its northern limit on the east coast has been given as 77°37′, and on the west coast as about 76°30′ (SEIDENFADEN & SØRENSEN, 1937, p. 59, 173).

### *Oxyria digyna* (L.) HILL

Common to abundant in a wide variety of sites ranging from dry to wet, open to closed vascular plant cover, and disturbed to relatively stable surficial soil. In the breadth of its tolerance it resembles *Polygonum viviparum*, though it appears to differ somewhat from that species in the nature of its relation to factors of disturbance. Although both species can withstand frost heaving and the intensive disturbance in the fine-textured silty soils of sorted nets and small gelifluction lobes. *Oxyria digyna* appears more commonly on these sites than *Polygonum viviparum*. On the other hand, where physical disturbance is due to wind, as in duned sand, or possibly in the grus on the tops of trap knobs, *Polygonum* is more common. *Oxyria* grows in equally dry places, on the cracked silt loams, on the tops of gravelly slushflow fans, and in dry sandy soils on the tops of till knolls. It seems to grow most luxuriantly on moist disturbed soil, and is a common weed at roadsides and around habitations.

Only a part of the range of tolerance noted for this species at Mesters Vig has been recorded by other observers in the fjord region. GELTING (1934, p. 89–90) merely noted that it was common, frequent on bare

soil, and a subordinate element in a large number of associations. SØRENSEN (1933, p. 50–51) gave its habitat as moist soil, mostly in snow-patches; and though he listed it in four ecosystems (1937, p. 113), all of them are in his moist to wet series, and none involves soils that show excessive physical disturbance. OOSTING (1948, p. 259–60) listed it only in rather stable moist sand.

Hemicryptophyte, with taproot (GELTING, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 72; HULTÉN, Fl. Al., p. 607–8; POLUNIN, Circ. Fl., p. 155). It is widely distributed in all the coastal districts of Greenland (BHJ., p. 142; PORSILD, l. c., map 129; cf. MOONEY & BILLINGS, 1961, p. 1–29, for a recent map of the North American range of this species and a discussion of its physiological ecology).

### ***Polygonum viviparum*** L.

Found in nearly every kind of habitat in which vascular plants grow. It avoids the standing water of shallow lakes and ponds, and the sea beaches that are reached by tides. Likewise it seems unable to live on some of the more active river gravels in the beds of larger streams, where *Epilobium latifolium* can survive. However, it is found on the heavily scoured beds of smaller streams on the mountain slopes, and it is common on the lowest terraces along the main streams, just above the main channels. It was observed at all levels on the soil moisture gradient, from saturated meadows to blowing sand on high beaches, or to the dry, cracked, clayey silt loams of the long slopes at the base of the mountains. On the silt loams and on the sands it was commonly in vascular plant coverages of 1 % or less, and it was observed in coverages ranging from this all the way to 90 %. It occupies relatively stable surficial soils in wet meadows, turf hummocks, and heath tundra, but at the same time can survive the intense disturbances of wind deflation, frost heaving of moist, fine-textured soils uninsulated by coverings of turf or moss, and the displacement of surface materials that occurs in silt and till gelifluction lobes. It is probably most abundant, and grows most vigorously, in damp to wet, hummocky moss-sedge meadows. Occurs as a weed in disturbed soil around habitations.

Earlier observations in the fjord region indicate a large portion of the wide tolerance noted above, but do not show the extent of the species in the drier part of the moisture gradient, nor in the disturbance gradient as a whole. SØRENSEN (1933, p. 51–2) noted it nearly everywhere except in the driest places and in the deepest snow-patches. He listed it in all three of his moderately moist ecosystems and in four moist to wet ones, but in none of his dry ones (1937, p. 113). GELTING (1937,

p. 26–7) merely stated that it was very frequent in numerous mostly snow-covered, damp plant communities.

Geophyte, with a stem tuber (GELTING, 1934, p. 297).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 72–3; 1958, map 2; HULTÉN, Fl. Al., p. 620–23; POLUNIN, Circ. Fl., p. 158). It is known in all the coastal areas of Greenland (BHJ., p. 143; PORSILD, l. c., map 130).

### *Stellaria Edwardsii* R. Br.

*Stellaria ciliatosepala* TRAUTV.
*Stellaria longipes* GOLDIE, of authors, in part.

Occasional to common in moist, hummocky, heath tundra, usually in dense vascular plant cover (81–90%). However, it was found also in remarkably dry, clayey silt loam at the base of a large boulder on the slopes of the Labben peninsula at experimental site 5. The surficial soils in all of these sites are relatively stable, though some are subject to mass flowage.

SØRENSEN listed this species in six ecosystems (1937, p. 112), all in the moderately moist and moist to wet series. In 1933 (p. 37) he noted its habitat as damp places covered with vegetation, but some of the ecosystems he mentions have scattered plants. GELTING (1934, p. 55) saw it in barren, dry, mineral ground as well as in damp soil, and thought that it probably was most common in the drier soils.

Chamaephyte, with taproot and subterranean runners (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 75). In eastern Greenland it is known from the Scoresby Sund region northward to about lat. 78°, and in the west from about 66°30′ to about 78°30′; it is also found on the north coast (BHJ., p. 154; BÖCHER, 1951, p. 417, fig. 5; PORSILD, l. c., map 134).

### *Stellaria humifusa* ROTTB.

Common locally on sandy sea beaches within reach of high tides, in bays and inlets that are well protected from wave and ice action, and where the shores are free of ice relatively early in the season. These sites in the Mesters Vig district have low vegetative coverage, usually not more than 10%. They are subject to considerable physical disturbance, even on protected shores.

Observations by GELTING (1934, p. 54–5) and SØRENSEN (1933, p. 36–7; 1937, p. 112) add nothing to the above, except that SØRENSEN saw the species on clayey shores as well as on sands.

Chamaephyte, with taproot (GELTING, 1934, p. 54–5).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 75; HULTÉN, Fl. Al., p. 653–4; POLUNIN, Circ. Fl., p. 188). Known in all the Greenland coastal districts except the north (BHJ., p. 154; PORSILD, l. c., map 136).

### *Cerastium alpinum* L.

Common to abundant in sites that range from dry to wet, but most frequent toward the drier parts of the moisture gradient. It is found in hummocky moss-sedge meadows, on turf hummocks, and in heath tundra on moist mountain slopes, but it is more common on ledges, stony till knolls, river terraces, and damp sandy or silty soils. On the vascular plant coverage gradient it is generally distributed, from sites that are nearly barren of any vegetation to those with coverages of 80–90 %. It grows in both stable and disturbed soils, and appears able to survive intense physical disturbance due to frost action or to other geomorphic processes. It is common in the wind-blown sand of the upper sea beaches beyond reach of high tide, and grows on newly displaced soil on steep river banks, or in loose stony grus on the tops and upper slopes of trap ridges. At the same time it survives the intense heaving of the active silt centers of sorted nets, and lives in the centers of debris islands of the summit of Hesteskoen. It lives in the actively moving surface soils on the tops of large till gelifluction lobes, and is a weed in the disturbed soils along roadways and around habitations.

The wide range of tolerance shown by his species in the moisture and coverage gradients is amply borne out by observations elsewhere in the fjord region. GELTING (1934, p. 34–8) found it on soil of every degree of moisture, though most frequently on dry soil. SØRENSEN in 1933 (p. 24) noted it mostly in dry, but also in damp soil. In 1937 (p. 112) he listed it in three dry ecosystems, one moderately moist, and one moist to wet. When these ecosystems are interpreted, the species is seen to occupy a wide variety of vegetative coverages in them.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

*Cerastium alpinum* is here treated in a broad sense, including ssp. *lanatum* (LAM.) ASCH. & GRAEBN.

Geographic distribution: Amphi-Atlantic, extending westward to Hudson Bay and the western Arctic Archipelago, and eastward to Spitzbergen, Novaya Zemlya and Scandinavia (PORSILD, Ill. Fl., p. 76–7; HULTÉN, Amph. Pl., p. 40, map 22). In Greenland it is known, sens. lat., in all the coastal districts (BHJ., p. 148–50; PORSILD, l. c., maps 138, 140; SEIDENFADEN & SØRENSEN, 1937, p. 171).

### *Cerastium arcticum* Lange

*Cerastium alpinum* L. of authors, in part.

Apparently rare in the Mesters Vig district, and collected in a single locality. It was growing in moist tundra on the northeast slope of Hesteskoen in the vicinity of Camp Tahoe (nos. 676, 689).

Chamaephyte, with taproot.

Geographic distribution: Amphi-Atlantic (Hultén, Amph. Pl., p. 32, map 13; BHJ., p. 150). According to Hultén (l. c.) it ranges eastward to Novaya Zemlya, the Scandinavian mountains and Scotland; and westward to the western shores of Hudson Bay and to the western Canadian Arctic Archipelago (cf. Porsild, Ill. Fl., map 140). In Greenland it is known in all the coastal districts (BHJ., p. 150).

### *Cerastium cerastoides* (L.) Britt.

*Cerastium trigynum* Vill.

Apparently rare in the Mesters Vig district. It was found in wet turf on the lower parts of the fronts of large till gelifluction lobes on the upper slopes of Hesteskoen, where the soils were kept moist by water from thawing ground. The vascular plant coverage is relatively dense in these areas (60–90%), and the surficial soils probably are fairly stable though subject to mass flowage.

Judging by the notes of earlier observers this species is rare also in other parts of the fjord region (Gelting, 1934, p. 45; Sørensen, 1933, p. 25). Sørensen (1937, p. 138) listed it in a single (moist to wet) ecosystem: Seasonally submerged alluvial meadows.

Chamaephyte, with taproot (Gelting, 1934, p. 290).

Geographic distribution: Amphi-Atlantic, extending westward to Labrador and southern Baffin Island, and eastward to Scandinavia and the Urals (Porsild, Ill. Fl., p. 77, map 142; Hultén, Amph. Pl., p. 48, map 30). In Greenland it is known in all the southerly coastal districts, reaching northward in the west to about lat. 72°, and in the east to about 73°30′ (BHJ., p. 148; Porsild, l. c.; Böcher, 1954, p. 111, fig. 28).

### *Sagina intermedia* Fenzl

Common to abundant in disturbed sandy soils particularly on upper sea beaches beyond the reach of high tides, where the sand is dry and duned. It also occurs in damp areas among mature turf hummocks, where the mineral soils are subject to frost heaving. It was seen only in low vegetative coverages (6–20%). Occurs as a weed in disturbed soils around habitations.

Earlier observations on the habitat of this species in the fjord region are consistent with those at Mesters Vig. GELTING (1934, p. 52) found it always in damp clayey or sandy soil. SØRENSEN (1937, p. 112) listed it in three moist to wet ecosystems: Snow-patches and polygon fields, Constantly irrigated fields, and Sea shore lagoons.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 78; HULTÉN, Fl. Al., p. 670–72; POLUNIN, Circ. Fl., p. 183). It is known in all the coastal districts of Greenland (BHJ., p. 152; SEIDENFADEN & SØRENSEN, 1937, p. 171).

### *Arenaria humifusa* WAHLENB.

Found in a single locality in the Mesters Vig district, in moist, hummocky heath tundra near the shore of a small lake between map summits 180 and 186, on the lower northwest slope of Hesteskoen. There it was common, in flower Aug. 4 (no. 603), growing in dense vascular plant coverage in soils that are surficially stable though probably subject to mass flowage.

Hemicryptophyte, densely or loosely caespitose, with slender rhizomes and fibrous adventitious roots.

Geographic distribution: Amphi-Atlantic, extending west to Alaska and east to Spitzbergen (HULTÉN, Amph. Pl., p. 188, map 169; cf. also POLUNIN, Circ. Pl., p. 174). The Greenland range of this species is limited by BHJ (p. 155) to the west coast from Disko Bugt to Inglefield Land, but PORSILD (Ill. Fl., map 147) and HULTÉN (l. c.) both add a station at about lat. 61° in South Greenland. The Mesters Vig collection noted above appears to be the first record for the eastern coast.

### *Arenaria pseudofrigida* (OSTF. & DAHL) JUZ.

*Arenaria ciliata* L. ssp. *pseudofrigida* OSTF. & DAHL

Occasional or locally common on loose, dry or merely damp sandy or grus soils, on talus slopes or on the tops of trap knobs and ridges. It usually occurs in relatively open vegetation (11–20 % coverage) and in surface materials that are fairly stable except on some dry talus slopes where there is slow creep.

Observations elsewhere in the fjord region are in general consistent with the above. SØRENSEN (1933, p. 23–4) noted it in dry localities exposed to the wind, and in 1937 (p. 112) he placed it in two of his dry ecosystems: Barren ground and Sunny slopes. GELTING (1934, p. 33–4) mentioned that it avoided closed vegetation, and gave its habitat as sandy and

clayey soils rich in lime. The latter condition does not appear essential at Mesters Vig.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Amphi-Atlantic, extending from Northeast Greenland to Spitzbergen, northern Scandinavia, Finland, and northern Russia (HULTÉN, Amph. Pl., p. 84, map 65). In Greenland it is confined to the northeast coast from Kap Dalton to Peary Land (BHJ, p. 155).

### ***Minuartia rubella*** (WAHLENB.) HIERN.

*Arenaria rubella* (WAHLENB.) SM.

Common in dry sandy soils throughout the district, on the tops of the ancient delta remnants, on stony till knolls, in grus accumulations on the tops and upper slopes of trap knobs and ridges, and on slushflow fans. It was usually seen in low vascular plant coverages (1–20%), but was occasionally found in higher densities (up to 70%). Although its habitats nearly all have excessive internal drainage in their soils, and most were on fairly level ground, there is some evidence that the species can survive a certain amount of physical disturbance. It grows, for instance, on sandy debris islands on the summit of Hesteskoen which give indication of considerable disturbance in their surface materials. Also it is found in the nearly barren centers of the large polygons studied at experimental site 20. The causes of the near absence of vegetation on these polygons are, however, obscure. Common as a weed in the disturbed soils around habitations.

Most of the observations of this species made by others in the fjord region are consistent with those at Mesters Vig. GELTING (1934, p. 50–51) says nothing about its relation to the moisture gradient, but says it is never gregarious and is most frequent on barren soil. SØRENSEN (1937, p. 112) listed it in five of his six dry ecosystems. It is of particular note, however, that he also listed it in one moist to wet ecosystem: Sheltered sunny slopes and patches, which considerably extends its range of tolerance in the moisture gradient.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 80; HULTÉN, Fl. Al., p. 685–6; POLUNIN, Circ. Fl., p. 174). Known in all the coastal districts of Greenland (BHJ., p. 158; PORSILD, l. c., map 148).

### ***Minuartia Rossii*** (R. BR.) GRAEBN.

*Arenaria Rossii* R. BR.

Apparently rare in the Mesters Vig district, and seen only in a single locality on the long gentle slopes of the Labben peninsula near experi-

mental sites 2, 3, and 9. It was in damp sandy soil having a thin cover of vegetation (vascular plant coverage 11–20%). These soils appear to be relatively stable, though they may be subject to a considerable amount of frost heaving in autumn.

Judging by the observations of others this species is rare elsewhere in the fjord region as well. GELTING (1934, p. 49–50) found it on damp clayey calcareous soil. SØRENSEN in 1933 (p. 33–4) gave its habitat as among pebbles wetted by snow melt. In 1937 (p. 112) he listed it in a single wet ecosystem: Constantly irrigated fields.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Amphi-Atlantic, with its main range, sens. lat., in alpine and arctic North America, but with extensions to Spitzbergen and to eastern Siberia (HULTÉN, Amph. Pl., p. 178, map 160). According to HULTÉN (l. c.) and MAGUIRE (1958, p. 46), *M. Rossii* sens. str., in America does not reach west of the Mackenzie River. Cordilleran and Alaskan representatives of the species are believed by MAGUIRE (1958) to form two subspecies, *columbiana* and *elegans*. In Greenland *M. Rossii* seems to be confined to the north and northeast coasts, extending southward on the latter at least to Mesters Vig, about lat. 72°12′ (BHJ., p. 156; BÖCHER, 1954, p. 177, fig. 47; PORSILD, Ill. Fl., map 149).

### ***Minuartia biflora*** (L.) SCH. & THELL.

*Arenaria sajanensis* WILLD.

Occasional to common in wet moss-sedge meadows, hummocky wet meadows, and on both growing and deteriorating turf hummocks. It is common on damp silty soils kept moist by snow melt or thawing ground, and in damp sands in shallow depressions on the tops of the ancient delta remnants; but it also occurs on dry sandy knolls in the delta remnants, and is common on the duned sandy sea beaches above the reach of high tides. On the silts and sands it grows in open vascular plant coverages, but is found in nearly every category between 1% and 90% coverage. Its capacity to survive disturbance by frost heaving is uncertain, but does not seem to be very great. It was found at the borders of sorted nets, which are the most stable portions of these features. Many of its habitats are subject to mass flowage, but the surficial soils are relatively stable. On the other hand, this species appears able to withstand a great deal of physical disturbance due to displacement of its soils by wind, gravity, water, or by a combination of gravity and frost. It grows successfully along small stony watercourses that are subject to heavy flooding in spring, and it appears on the lowest river terraces, just above ordinary high water in the channels of the main rivers. On steep slopes of dry river bluffs, and in dry, loose sand on steep

south-facing slopes among the delta remnants, it survives on exceedingly unstable substrata. The same is true among the sand dunes on the upper beaches. It occurs as a weed in the disturbed soils around habitations.

GELTING (1934, p. 49) noted this species on both dry and wet soils, but SØRENSEN (1937, p. 112) listed it in a single ecosystem in his moist to wet series.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 80; HULTÉN, Fl. Al., p. 680; POLUNIN, Circ. Fl., p. 174). It is known in all the coastal districts of Greenland except the north. On the west coast its northern limit is at about 78°, and on the east coast at about 77°30′ (BHJ., p. 158; PORSILD, l. c., map 151).

### ***Minuartia stricta*** (SW.) HIERN.

*Arenaria uliginosa* SCHLEICH.

Apparently rare in the Mesters Vig district. Found in damp sandy soils that are probably fairly stable and have low vascular plant coverage (1–5 %).

GELTING (1934, p. 51) regarded this plant as rare in the middle part of the fjord region, and gave a habitat for it somewhat similar to that at Mesters Vig: damp sandy places among mosses. SØRENSEN (1933, p. 34–5) seems to have found it more common in the southern part of the region, growing in damp grass and dwarf shrub vegetations. Among his ecosystems, however (1937, p. 137), he listed it only in one of the moist to wet series: Knolly bogs.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar, probably with discontinuities in its range (PORSILD, Ill. Fl., p. 80; cf. also HULTÉN, Fl. Al., p. 686–7; POLUNIN, Circ. Fl., p. 174–5; GRÖNTVED, Fl. Icel., p. 223–4). Its range in Greenland is confined to portions of the east and west coasts: in the east between Scoresby Sund and about lat. 74°30′, and in the west approximately between lats. 68°30′ and 73° (BHJ., p. 158; PORSILD, l. c., map 150).

### ***Silene acaulis*** L.

One of the commonest species of vascular plants in the Mesters Vig area, occurring in a great variety of sites. On the moisture gradient these sites range from wet moss-sedge meadows, hummocky wet meadows and turf hummocks, through merely damp silty or sandy soils, to dry sites like those found on stony till knolls, in loose, stony grus on the tops of trap ridges, on sandy knolls in the ancient delta remnants, or in the duned sand of the upper sea beaches beyond reach of ordinary high

tides. It grows in the nearly barren, clayey silt loams of the long gentle slopes bordering the fjord, where the surface is dry and brittle in summer and the vegetative coverage is sometimes less than 1%. Between this extremely open vegetation and the dense coverage of the heath tundra on moist mountain slopes it is to be found in every degree of vegetative closure. Its capacity to survive physical disturbance is shown by its presence in the duned sand, in the active silty centers of sorted nets, on the surfaces, fronts and lower lateral margins of small, active silt gelifluction lobes, and in the creeping sandy soil of steep south-facing slopes in the delta remnants. It grows in the most actively moving surface soils on the tops of large till gelifluction lobes. Around habitations it behaves as a weed in disturbed soils.

The wide range of this species in the moisture and coverage gradients is borne out by observations elsewhere in the fjord region. GELTING (1934, p. 52–4) found it in dry as well as moist soil. SØRENSEN in 1933 (p. 35–6) noted it in dry and, more frequently, in somewhat damp places. In 1937 (p. 112) he listed it in only two ecosystems, but one of them was the driest (Barren ground), and the other was in the moist to wet series and in relatively dense cover (Sheltered sunny slopes and patches).

Chamaephyte, with taproot (GELTING, 1934, p. 290).

The Mesters Vig plants, and probably all those in Greenland, represent var. *exscapa* (ALL.) DC.

Geographic distribution: Amphi-Atlantic, but with a wide range, extending westward across northern America to the Chukch Peninsula and Kamtchatka, and eastward to Novaya Zemlya, northern Russia, Scandinavia and the Alps (HULTÉN, Amph. Pl., p. 198, map 180; POLUNIN, Circ. Fl., p. 184). In Greenland it is known in all the coastal districts (BHJ., p. 161; PORSILD, Ill. Fl., map 152).

### ***Melandrium apetalum*** (L.) FENZL ssp. ***arcticum*** (FR.) HULT.

*Lychnis apetala* L. var. *arctica* FR.

Common in damp sandy, silty, or turfy soils. It is found in heath tundra on moist mountain slopes, and on both growing and deteriorating turf hummocks, but is perhaps most frequent on sandy soils that are kept moist by water from melting snow and thawing ground. That it can withstand some desiccation is shown by its presence on the disintegrating turf hummocks, the turf of which becomes fairly dry in late summer. Apparently it is able to survive a good deal of physical disturbance, for it was found growing rather commonly on the active surfaces of large till gelifluction lobes which are known to be in motion down-

slope. It was seen in a wide range of vegetative coverages, from less than 1 % to 90 %.

General observations on the habitat of this species made elsewhere in the fjord region by GELTING (1934, p. 46–7) and SØRENSEN (1933, p. 26; 1937, p. 112) are consistent with the above. However, there is little in the earlier notes to indicate its relationship to the disturbance factors.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 82; HULTÉN, Fl. Al., p. 700–1). Known in all the northerly coastal districts of Greenland, southward to Disko Bugt in the west and to about lat. 69° in the east (BHJ., p. 159; PORSILD, l. c., map 153).

### ***Melandrium affine*** (J. VAHL) HARTM.

*Lychnis affinis* J. VAHL

Occasional to common in sites ranging from moist to dry, but most frequent in habitats in the drier portion of the moisture gradient. It occurs on turf hummocks, in heath tundra on moist mountain slopes, and in damp sandy soils kept moist during the summer by snow-melt and thawing ground, but it is more common on dry ledgy slopes, stony till knolls, and on sandy knolls among the ancient delta remnants. It endures extreme desiccation in the dry, cracked silt loams of the lower slopes bordering the fjord, and in the loose, stony grus on the tops of trap knobs and ridges. On the vascular plant coverage gradient it is found at many points ranging from less than 1 % to 90 %. That it is capable of surviving considerable physical disturbance is shown by its presence in the creeping soil on dry ledges and steep south-facing sandy slopes in the delta remnants. Its presence on active slushflow fans indicates that it can weather periodic violent displacement. It grows as a weed in disturbed soils around habitations.

Earlier observations on the habitats of this species and of *M. triflorum* are confused because the two were not separated prior to the work of SEIDENFADEN and SØRENSEN (1937, p. 32). SØRENSEN placed *M. affine* in four ecosystems (1937, p. 112), all in the dry series and showing a wide range in the coverage gradient. He also listed his *M. triflorum* in dry ecosystems, but GELTING (1934, p. 47–9) stated that some of his *M. triflorum* also grew in moderately damp soil. However, because a part of GELTING's plants were *M. affine*, it is impossible to tell from the published notes which species has the wide tolerance in the moisture gradient. It is possible that both of them do.

Hemicryptophyte, with taproot (cf. BÖCHER, 1938, p. 79).

Geographic distribution: *Melandrium affine*, in the broad sense as considered here, appears to be circumpolar (cf. JSW., p. 60–61; POLUNIN, Circ. Fl., p. 180; HULTÉN, Fl. Al., p. 702–3; PORSILD, 1943, p. 33–5). In Greenland it is known on the northeast coast between Scoresby Sund and Danmark Fjord, and on the west from about lat. 66°30′ north to Inglefield Land (BHJ., p. 160). PORSILD (Ill. Fl., map 154) gives localities for it also on the north coast.

### ***Melandrium triflorum*** (R. BR.) J. VAHL

*Lychnis triflora* R. BR.

Not seen in the study area in the vicinity of Tunnelelv or the Nyhavn and Labben peninsulas, but collected by GUDMUNDSSON and BJÖRNSSON near Ekspeditionshus in Mesters Vig (bay) (Herb. H. R.).

SØRENSEN noted the habitat of this species in two dry ecosystems (1937, p. 112): Bird places, and Clayey flats and raised beaches. See note under *M. affine*.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: A species of limited range, apparently confined to the northern parts of the Canadian Arctic Archipelago and the northerly coastal districts of Greenland. In Greenland it extends southward in the west to about lat. 66°30′, and in the east to Scoresby Sund (PORSILD, Ill. Fl., p. 82, map 155; BHJ., p. 159–60; POLUNIN, Circ. Fl., p. 180).

### ***Viscaria alpina*** (L.) G. DON

*Lychnis alpina* L.

Apparently rare in the Mesters Vig district, though in the few places where it was found it was locally common. It was growing on the steep, rather dry, southeast-facing slope of a river bluff, in sandy soil subject to slow creep. The vegetative coverage was of the order of 30 % and consisted of grasses, sedges, heaths, *Potentilla*, *Arnica*, etc.

This species comes into the fjord region only at the south, where most earlier observers have made no comments on its habitat. BÖCHER (1938, p. 86–7) noted that in the area north of Scoresby Sund it was found in south-exposed, luxuriant, rather open heaths.

Hemicryptophyte (BÖCHER, l. c.), with taproot.

Geographic distribution: Amphi-Atlantic, reaching westward to Labrador, Newfoundland, and the southern part of Hudson Bay, and eastward to Iceland, Scandinavia, the Alps, and northern Russia (HULTÉN, Amph. Pl., p. 68, map 49; PORSILD, Ill. Fl., p. 83). The species is southern in Greenland, extending from the southern tip north on the west coast to about lat. 72°30′, and on the east to about 73°10′ (BHJ., p. 160; GRÖNTVED, Fl. Icel., p. 233). HULTÉN (l. c.) has considered the

Greenland and American plants as var. *americana*, suspecting that they may have a different chromosome number from that of the European. This has proved not to be the case, however (cf. JSW., p. 60).

### ***Ranunculus trichophyllus*** CHAIX var. ***eradicatus*** (LAEST.) W. B. DREW

*Ranunculus confervoides* (FR.) ASCH. & GRAEBN.
*Ranunculus aquatilis* L. var. *eradicatus* LAEST.

Found in a single locality in the Mesters Vig district, where it was floating in the shallow water of a small lake between map summits 180 and 186, on the lower northwest slope of Hesteskoen (no. 602, Aug. 4, 1957).

Observations made by GELTING (1934, p. 96–7) and by SØRENSEN (1933, p. 57–8; 1937, p. 136) elsewhere in the fjord region indicate habitats similar to the above, and also that the species is relatively infrequent in other districts also.

Hydrophyte, without bulbils (GELTING, 1934, p. 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 86; BENSON, 1948, p. 39–40). Its range on the east coast of Greenland is between 60° and about 74°30′, and on the west from 60° to about 76°30′ (BHJ., p. 63). PORSILD (Ill. Fl., map 162) adds a northwestern station in the region of Thule.

### ***Ranunculus hyperboreus*** ROTTB.

Occasional in shallow water or moss mats at the margins of small lakes, or in wet moss at the bases of cliffs where the vegetation is kept saturated by moisture from above derived from melting snow and thawing ground. Found only in sites with high moisture content, and relatively low vascular plant coverage.

Observations elsewhere in the fjord region are consistent with the above (GELTING, 1934, p. 93–94; SØRENSEN, 1933, p. 55; 1937, p. 113; OOSTING, 1948, p. 250, 251).

Hydrophyte-Helophyte, with adventitious roots from nodes of the stem (GELTING, 1934, p. 93–94, 296).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 88; HULTÉN, Fl. Al., p. 757–58; POLUNIN, Circ. Fl., p. 206). Known in all the coastal districts of Greenland (BHJ., p. 64; PORSILD, l. c., map 165).

### ***Ranunculus nivalis*** L.

Common in wet moss-sedge meadows, and in damp sandy soils that are kept moist during the summer by water from snow-melt or thawing

ground. Although always found in more or less moist habitats, it seems to be tolerant of at least partial desiccation, for it grows in small watercourses that become rather dry in late summer, and it was found in shallow, merely damp saucer-like depressions in the ancient delta remnants. Most of its sites have relatively low vascular plant coverage (6–30 %), though in some situations, on the fronts of large till gelifluction lobes, the vegetation is dense (60–90 %). Most of the damp, sandy sites are probably subject to frost heaving in autumn, and many of the turf soils are subject to mass flowage though they are surficially stable. Its capacity to survive physical disturbance is best shown by its presence on the actively moving surface soils on the tops of large till gelifluction lobes.

Earlier observations on the positions of this species and of *R. sulphureus* in the moisture and coverage gradients are generally consistent with those at Mesters Vig (GELTING, 1934, p. 94; SØRENSEN, 1933, p. 55–6; 1937, p. 113). They are not given in enough detail, however, to be interpreted in terms of disturbance factors.

Hemicryptophyte, with short vertical rhizome and fleshy adventitious roots (GELTING, 1934, p. 94, 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 88–9; HULTÉN, Fl. Al., p. 760–1; POLUNIN, Circ. Fl., p. 206). On the West Greenland coast it ranges between the Thule district and about lat. 67°, while on the east coast it has been found between lat. 78° and Scoresby Sund (BHJ., p. 66; PORSILD, l. c., map 169).

### ***Ranunculus sulphureus*** SOLAND.

Common in habitats similar to those in which *R. nivalis* is found. The two species are easily confused, in the field, for they grow together and must be examined closely to be told apart. Field notes in the Mesters Vig area suggest that *R. sulphureus* may be more common in sites with turfy soils or wet silts than in sands, though this rests upon too little evidence to be more than a suggestion.

See note on observations of *R. nivalis* elsewhere in the fjord region. Both GELTING (1934, p. 96) and SØRENSEN (1937, p. 113) consider these two species as snow-patch plants.

Hemicryptophyte, with short vertical rhizome and fleshy adventitious roots (GELTING, 1934, p. 96, 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 80; 1958, map 1; HULTÉN, Fl. Al., p. 769–70; POLUNIN, Circ. Fl., p. 206). Known in all the northerly coastal districts of Greenland, southward in the west to about lat. 68°40′, and in the east to Kap Dalton (about lat. 69°25′) (BHJ., p. 65–66; PORSILD, l. c., map 170).

### *Ranunculus pygmaeus* Wahlenb.

Common, or locally abundant in damp sandy soils, in bare sand or in thin black organic crusts. Although most frequent in low vascular plant coverages (6–40 %), it was occasionally seen in dense vegetation such as occurs on the fronts of large till gelifluction lobes. Most of the sites on which it grows probably are subject to frost-heaving in autumn, and its ability to withstand this kind of disturbance is shown by its presence in the centers of debris islands.

Regarded as a snow-patch plant by both Gelting (1934, p. 95–6) and Sørensen (1933, p. 56–7). Gelting noted that he found it in gravelly or clayey soil. Sørensen (1937, p. 113) listed it in only one (moist to wet) ecosystem.

Hemicryptophyte, with short vertical rhizome and adventitious roots (Gelting, 1934, p. 95–6, 294).

Geographic distribution: Circumpolar (Porsild, Ill. Fl., p. 89; Hultén, Fl. Al., p. 765–6; Polunin, Circ. Fl., p. 206). In Greenland it is known in all the coastal districts except the north, reaching its northern limit in the west at about 80°, and in the east at about 77°40′ (BHJ., p. 64; Porsild, l. c., map 172; Seidenfaden & Sørensen, 1937, p. 173).

### *Thalictrum alpinum* L.

Occasional, or locally common in hummocky, wet moss-sedge meadows, usually near the shores of small lakes or in seepage areas kept wet throughout the season by melting snow or thawing ground. Found only in vascular plant coverages of high density (81–90 %), and in turfy soils that are relatively stable at the surface. Many such sites, however, are subject to mass flowage.

Gelting (1934, p. 97) noted this species as very rare in the central part of the fjord region, and made no habitat notes for it. Sørensen (1933, p. 58), in the southern part of the region, noted it "especially in grassy spits affected by solifluction." In 1937 (p. 136) he listed it in a single, moderately moist ecosystem: Fronts of earth glaciers. The surficial soils in both the sites noted by Sørensen probably were relatively stable, though they may have been moving en masse.

Hemicryptophyte, with short horizontal rhizome and many adventitious roots (Gelting, 1934, p. 97, 294).

Geographic distribution: Circumpolar, but with a much disrupted range (Hultén, Amph. Pl., p. 238, map 220; Porsild, Ill. Fl., p. 90). In Greenland it is known in the southerly coastal districts, reaching northward in the west to about lat. 71°, and in the east to 73°38′ (BHJ., p. 69).

### *Papaver radicatum* ROTTB.

Common in relatively dry sandy soils. In a few places it grows in sites that are kept damp to the surface during the summer by seepage from snowmelt or thawing ground, but more commonly the surface materials are drier than this. Characteristic habitats are sandy knolls and flat gravelly surfaces on the tops of the ancient delta remnants, loose stony grus on the tops of trap knobs and ridges, and dry stony till knolls. Almost invariably it is found in open vegetation, in coverages ranging from 1 % to 20 %, or in unusual cases, 30–40 %. Apparently it is able to survive a great deal of physical disturbance, for it is common in the duned sand of the upper sea beaches beyond reach of ordinary high tides. Also it was found in sandy debris islands on the summit of Hesteskoen, and in newly slipped soil on a steep, undercut river bank. Common as a weed in disturbed soils around habitations.

GELTING (1934, p. 85–8) noted that it preferred dry soil, but that it extended far into snow-patches. In describing its habitats he mentioned "extremely dry" sites, "moderately damp soil," and some "closed plant associations." SØRENSEN in 1933 (p. 49) said that he found it on dry as well as on fairly damp soil, and in 1937 (p. 113) he listed it in both dry and moderately moist series of ecosystems. In the latter he placed it in Well-drained fields. Thus the observations of SØRENSEN and GELTING on the range of the species in the moisture gradient are essentially consistent with those at Mesters Vig, but they extend its range in the coverage gradient. OOSTING's notes (1948, p. 254–60) may be interpreted in the same way.

Hemicryptophyte, with taproot (GELTING, 1934, p. 295).

Geographic distribution: *Papaver radicatum* is here considered in a broad sense, as a circumpolar species complex (cf. HULTÉN, Fl. Al., p. 805–6; SEIDENFADEN & SØRENSEN, 1937, p. 173; GRÖNTVED, Fl. Icel., p. 240–1). If, on the other hand, it is subdivided into geographic phases, PORSILD is probably correct in assigning the name *P. radicatum* to the plant of Greenland and the American Arctic west to the Mackenzie (Ill. Fl., p. 90, map 175). In Greenland the species is known in all the coastal districts (BHJ., p. 104; PORSILD, l. c.).

### *Draba alpina* L.

Common in a variety of sites ranging from moist to dry, and involving organic, sandy, and silty soils. It is occasional on turf hummocks and in damp moss-sedge meadows, but is more common on mineral soils. On the long gentle slopes bordering the fjord it grows on the clayey silt

loams that become dry and brittle at the surface in summer, and nearby it is found on damp sandy soils kept moist by seepage from snow-melt and thawing ground. Most of its habitats have very low vascular plant coverage, ranging from less than 1 % to 30 %, but on turf hummocks the coverage may be as great as 80–90 %. Its capacity to withstand physical disturbance appears to be great, for it grows in the most active silt centers of sorted nets, and in debris islands.

The observations at Mesters Vig appear to extend the known tolerance of this species in the moisture gradient, but its ranges in the coverage and disturbance gradients have already been suggested. GELTING (1934, p. 69–70) found it mostly on moist soil, especially in closed vegetation, but he also saw it on bare wet gravel. SØRENSEN in 1933 (p. 44) noted it on wet ground only. In 1937 (p. 112) he placed it in one moderately moist ecosystem and two moist to wet ones. The second of the latter is Solifluction clay, in which the surficial soils are actively disturbed.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 95–96; HULTÉN, Fl. Al., p. 846; POLUNIN, Circ. Fl., p. 233–4). Widely distributed around the Greenland coasts, but with a somewhat discontinuous range, and apparently absent from the southeast coast between lat. 60° and about 67° (BHJ., p. 116; PORSILD, l. c., map 185; SEIDENFADEN & SØRENSEN, 1934, p. 172).

### *Draba Gredinii* E. EKMAN

This species was seen in the Mesters Vig district only on the summit and upper north slopes of Hesteskoen, though it probably occurs in similar situations elsewhere. It was most abundant on the front and upper surface of a large till gelifluction lobe at an altitude of about 660 m. On the front it was growing in moist turf, in a dense coverage of grasses, sedges and heath. The turf substratum itself was probably fairly stable, but was falling in masses over the front of the lobe. The surficial soils on the top of the lobe were active, and known to be moving downslope rather rapidly. They were moist to wet, with a low vegetative coverage (10–20 %). This lobe is experimental site 17.

The species was not recognized by GELTING, but SØRENSEN in 1937 (p. 112) noted it in two of his moist to wet ecosystems: Sheltered sunny slopes and patches, and Solifluction clay. These habitats are consistent with those observed at Mesters Vig.

Chamaephyte, with taproot.

Geographic distribution: Regarded by BHJ (p. 117) as a possible Greenland endemic, but SEIDENFADEN & SØRENSEN (1937, p. 45–7)

cited specimens from Spitzbergen and Novaya Zemlya which they determined as *D. Gredinii* (see also RØNNING, 1961, p. 10–11). In Greenland it is known only on the northeast coast, from Kap Dalton (lat. 69°25′) to lat. 79°12′ (BHJ., l. c.; SEIDENFADEN & SØRENSEN, l. c.).

### ***Draba nivalis*** LILJEBL.

Occasional to common in dry or merely damp sandy, gravelly or silty soils. In a few places it was found growing in damp moss or turf at cliff-bases or on the lower and lateral fronts of large till gelifluction lobes, but its usual habitat is in mineral soil that is relatively dry at the surface in summer. These sites are on gravelly talus slopes, in loose, stony grus on the tops and upper slopes of trap knobs and ridges, on dry, stony till knolls, on sandy knolls in the ancient delta remnants, and in loose sandy soil on dry ledges. The species also grows in the clayey silt loams that become dry and brittle at the surface in summer. It grows likewise in sandy soils kept moist throughout all or most of the summer by water from melting snow or thawing ground. Most of its sites have open vegetation (1 % to 30 % coverage), but where it grows in moss or turf substrata the coverage may be as great as 70 %. In general, the surficial soils of its sites appear to be relatively stable, though the damp sands probably are frost heaved in autumn. That it can survive disturbance is suggested by its presence on the loose soil of very steep slopes. These occur on some dry ledges, but more particularly on south-facing sandy banks among the delta remnants.

Earlier observations of this species in the fjord region are consistent with those made at Mesters Vig. GELTING (1934, p. 79) found it on sandy and clayey, mostly dry soil, and SØRENSEN in 1933 (p. 45) noted it in dry soil among grasses. The latter listed it in two dry ecosystems: Bird places and Sunny slopes (1937, p. 113).

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 97; 1958, map 2; HULTÉN, Fl. Al., p. 862–63; POLUNIN, Circ. Fl., p. 234). Known in all the coastal districts of Greenland except the north (BHJ., p. 112–13; PORSILD, l. c., map 188; GRÖNTVED, Fl. Icel., p. 250–1).

### ***Draba lactea*** ADAMS

*Draba fladnizensis* WULFÉN var. *heterotricha* (LINDBL.) BALL

This species is probably the commonest *Draba* in the Mesters Vig district, occupying a great variety of sites. It is occasionally seen in wet moss-sedge meadows, and is not uncommon on the organic substrata of turf hummocks and heath tundra, but it is most frequent on mineral

soils that range from moist to dry at the surface. It is abundant on sandy and silty soils kept moist during the summer by water from melting snow or thawing ground, but it is also common on dry stony till knolls, on gravel terraces along the main rivers, on sandy knolls in the ancient delta remnants, and in loose stony grus on the tops of trap knobs and ridges. On the vascular plant coverage gradient it is found in nearly all categories, from vegetation of less than 1 % coverage to 90 %. It seems to have large capacity to survive disturbance of various kinds. On the upper sea beaches beyond reach of ordinary high tides it grows in actively blowing sand. On gentle slopes bordering the fjord it grows on the active surfaces of small silt gelifluction lobes, and on more level areas it is found both at the borders and in the active silt centers of sorted nets. On the summit of Hesteskoen it is surviving whatever disturbance there is in the centers of sandy debris islands. On the north slope of Domkirken it is growing in the scoured beds of stony stream channels subject to violent flooding. It is able to survive in the actively moving surficial soils on the tops of large till gelifluction lobes high on the mountain slopes. At the same time it is a common weed in the disturbed soils around habitations.

The wide tolerance of this species in the moisture and coverage gradients has been noted previously in the fjord region, but only a suggestion of its range in the disturbance gradient may be inferred from the earlier notes. GELTING (1934, p. 78–9) stated that it had a very wide amplitude in the moisture scale, and that it occurred in a large number of plant associations as well as on more or less bare soil. SØRENSEN (1937, p. 112) listed it only in moist to wet ecosystems, but he placed it in five of these showing a wide range of moisture and coverage conditions.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 97–8; HULTÉN, Amph. Pl., p. 226, map 208). In Greenland it is known on the north coast, on the west coast southward to about lat. 62°30′, and on the northeast coast south to about 68°30′ (BHJ., p. 112; PORSILD, l. c., map 189; SEIDENFADEN & SØRENSEN, 1937, p. 172).

### *Draba fladnizensis* WULF.

Occasional in the Mesters Vig district, and where found it was in habitats similar to those of *D. lactea*. In addition to the few specimens seen in the study area it was collected by GUDMUNDSSON and BJÖRNSSON near Ekspeditionshus in Mesters Vig (bay) (Herb. H. R.).

GELTING (1934, p. 76–8) noted it as rather rare in the central part of the fjord region, growing in sheltered places with a luxuriant vegetation.

SØRENSEN (1933, p. 45), in the southern part, had difficulty distinguishing it from *D. lactea*, and said that both were most common in damp soil in the outer coastal districts. In 1937 (p. 112), in the northern part of the region, he listed *D. fladnizensis* in a single, moderately moist ecosystem: Fronts of earth glaciers.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: This species has long been recognized in the Greenland flora, and its differentiation from the closely related *D. lactea* is supported by chromosome counts (JSW., p. 69). However, most American students have not recognized it in the American North (PORSILD, Ill. Fl., HITCHCOCK, 1941, p. 108–9; FERNALD, 1934, p. 286–92). A map published by BÖCHER, on the other hand (1954, p. 177, fig. 47), gives it a range in the eastern American Arctic, with an additional area in Yukon and northern Alaska. HULTÉN (Amph. Pl., p. 226, map 207) uses much the same concept of the species, and makes it circumpolar with discontinuities in its range. BÖCHER's map of 1954 gives its range in Greenland as extending around the northern coasts, southward in the west to about lat. 62°30′, and in the east to about 68°. A still later publication (BHJ., 1957, p. 112) indicates a Greenland range limited to the east and northeast coasts.

### ***Draba subcapitata*** SIMM.

Occasional in the Mesters Vig district, and found only in damp to dry, sandy or gravelly soils, in open vegetation (1 % to 20 % coverage). The sites in which it was found were notable for the disturbed condition of their surficial soils. On the summit of Hesteskoen it was in the centers of sandy debris islands that appeared to be subject to rather intense frost heaving. On a scree slope near experimental sites 2, 3 and 9 the soil was scarcely more than at an angle of repose, and on a sandy upper sea beach beyond reach of ordinary high tide the plants were being alternately buried in sand by the wind, or blown out.

The relations of this species to the moisture, coverage, and disturbance gradients noted at Mesters Vig are suggested by earlier observations in the fjord region. GELTING (1934, p. 79–80) saw it most frequently in bare sandy or clayey soil, but noted that it occurred, though sparsely, in closed vegetation. The latter observation extends its range in the coverage gradient beyond that seen at Mesters Vig. SØRENSEN in 1933 (p. 45–6) found it on dry as well as on more damp soil. In 1937 (p. 113) he listed it in two dry ecosystems: Barren ground, and Clayey flats and raised beaches, and in one moist to wet ecosystem: Solifluction clay. In two of these ecosystems he placed it in potentially disturbed surficial soils.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: PORSILD (Ill. Fl., p. 98) suggests that the species is amphi-Atlantic, but it is more probably circumpolar with discontinuities in its range, for it has not been found in Alaska or Yukon (POLUNIN, Circ. Fl., p. 235; cf. also HULTÉN, Fl. Al., p. 868). It is known in all the northerly coastal districts of Greenland, south on the west coast to Disko Bugt, and on the east to Scoresby Sund, PORSILD records a station farther south on the east coast at ca. 68°30′ (BHJ., p. 112; SEIDENFADEN & SØRENSEN, 1937, p. 172; PORSILD, l. c., map 190).

### ***Draba oblongata*** R. BR.

*Draba micropetala* HOOK. of auth., at least in part.

Apparently rare or occasional in the Mesters Vig district. It was collected in only one locality, on damp sandy soil in the vicinity of experimental sites 2, 3 and 9 on the slopes of the Labben peninsula (no. 685). There the vegetative coverage was low (5–20 %), and the soils subject to moderate disturbance by frost action.

Although some recent authors have recognized both *D. oblongata* and *D. micropetala* in the Greenland flora, SØRENSEN and GELTING were not able to distinguish between the two in their studies of northeastern Greenland vegetation in the 1930's. SØRENSEN (1933, p. 45) and SEIDENFADEN & SØRENSEN (1937, p. 49–50) used the name *D. micropetala* for the complex, while GELTING (1934, p. 68, 71–2) used *D. oblongata.* It is presumed that they also made no distinction between them in their notes on habitat. GELTING (l. c.) noted the species in damp clayey or sandy soil, and stated that within the fjords it was a typical snow-patch plant. SØRENSEN (1937, p. 113) placed it in two moist to wet ecosystems: Snow-patches and polygon fields, and Constantly irrigated fields. He remarked that in the latitude of Traill Ø it was not rare in the outer coastal districts (1933, p. 45), but was not seen at all in the inner fjords. A little farther north GELTING (l. c., p. 72) found it "here and there" in the outer fjords, and rare in the inner ones.

A single number which may represent *Draba micropetala* HOOK. was found among the Mesters Vig collections. It was not recognized in the field, however, and habitat notes on it are inadequate for judgment on its local distribution. As previously mentioned, some authors consider this a valid species (BHJ., p. 116; JSW., p. 70), distinguished by having siliques oval rather than oblong to elliptic as in *D. oblongata.* PORSILD, on the other hand, considers the two identical (1955, p. 127–29).

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: The total range of this species is not well known. PORSILD (Ill. Fl., p. 98, map 191) places it in the northern part

of the Canadian Arctic Archipelago (west to Banks Island) and the northerly coastal districts of Greenland. He suggests that it may be an American endemic (see also PORSILD, 1955, p. 127–29), but HULTÉN (Fl. Al., p. 868) extends its range eastward to Spitzbergen, Novaya Zemlya, and the mouth of the Yenisei River, thus suggesting an amphi-Atlantic range. In Greenland it is known on the north coast, and southward in the east at least to Scoresby Sund. On the west coast BHJ (p. 116) note it southward to "CWn", but do not specify a locality in this latitude. They give the range of *D. micropetala* as essentially the same as that of *D. oblongata.*

### ***Draba glabella*** PURSH

*Draba hirta* of authors, not L.
*Draba daurica* DC.

Common in sites ranging, in the moisture gradient, from moist to dry, but most frequent toward the drier end of the gradient. It grows on the lower and lateral fronts of large till gelifluction lobes on the upper mountain slopes, and in damp sandy soils on the slopes at the bases of the mountains. In both of these situations the soils are kept moist during the summer by water from melting snow or thawing ground. But it is more common in the drier soils of steep river bluffs and terraces, dry south-facing ledges, or in the loose stony grus on the tops and upper slopes of trap knobs and ridges. Its driest sites may be the clayey silt loams of the slopes bordering the fjord, where the surface soils become desiccated to brittle hardness in summer. For the most part it grows in relatively open vegetation, in coverages ranging from less than 1 % to 50 %, but on the fronts of large gelifluction lobes it may be in coverages of 60–90 %. It seems able to survive a great deal of physical disturbance, for it is found in loose soil subject to creep on river bluffs and dry ledges, and especially on steep sliding sand banks on south-facing slopes among the ancient delta remnants. It was found growing on the newly displaced soil of an undercut river bank and it grows on the gravelly tops of the most active slushflow fans. Along the main rivers it occurs on the lowest terraces, just above ordinary high water, where the soils undergo yearly disturbance by flooding. It was one of the few plants growing in the nearly barren centers of the large polygons studied at experimental site 20, where the causes for the scarcity of plants are problematical. Common as a weed in the disturbed soils around habitations and along roadsides.

Earlier notes on the habitat of this species in the fjord region, taken together, corroborate the above as far as the moisture gradient is concerned, but they do not do justice to its range in the coverage

and disturbance gradients. GELTING (1934, p. 75–6) noted it especially in closed vegetation in moderately damp soil. SØRENSEN in 1933 (p. 44–5) found it only in dry soil. In 1937 (p. 112) he listed it in a single, moderately moist ecosystem: Sheltered precipices and rock ledges.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

*Druba glabella* is a polymorphic species and, as might be expected, its nomenclature has become highly complex. The name used here appears to be the oldest that is not confused (cf. FERNALD, 1934, p. 333–44).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 98–9; HULTÉN, Fl. Al., p. 853–5: POLUNIN, Circ. Fl., p. 234). On the west coast of Greenland it is known from about lat. 64°30′ to 78°30′, and on the east coast between lats. 69°25′ and 77°32′ (BHJ., p. 115; PORSILD, l. c., map 193; SEIDENFADEN & SØRENSEN, 1937, p. 172).

### ***Draba cinerea*** ADAMS

Occasional in dry sandy soils with a relatively open vegetative cover (commonly 1–5 % though sometimes 20–40 %). These sites are on gravelly talus slopes, sandy knolls on the ancient delta remnants, in stony grus on the tops of trap ridges, and in sandy soils on dry ledges. Because of excessive internal drainage the surficial soils in many such places are relatively stable, though in exposed situations they are subject to deflation by wind. The species can survive considerable displacement, however, as shown by its presence on the creeping soil of dry ledges, and more particularly on steep, sliding, south-facing sand banks among the delta remnants.

Notes on the habitat of this species made by GELTING (1934, p. 73–4) and SØRENSEN, (1933, p. 44; 1937, p. 112) are consistent with those made at Mesters Vig with one possible exception. SØRENSEN restricted it to dry sites, and GELTING did likewise except that he said it was found "exceptionally in snow-patches." This suggests that it may have a somewhat wider range in the moisture gradient than has been thought.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Circumpolar, though apparently with gaps in its range, especially in northern Asia (HULTÉN, Fl. Al., p. 849–50; PORSILD, Ill. Fl., p. 99). In Greenland it is known in the northerly coastal districts, extending southward in the west to about lat. 66°30′, and in the east to Scoresby Sund (BHJ., p. 113; PORSILD, l. c., map 194).

### *Draba groenlandica* E. EKMAN

*Draba cinerea* ADAMS of authors, in part.

Not found in the vicinity of the mouth of Tunnelelv or on the Nyhavn and Labben peninsulas, but collected near Ekspeditionshus by GUDMUNDSSON and BJÖRNSSON (Herb. H. R.).

This species was not sharply separated from *D. cinerea* by either GELTING or SØRENSEN and SEIDENFADEN. GELTING, however (1934, p. 74), regarded it as sufficiently well marked to cite specimens for it and discuss its habitat. He noted that it occurred exclusively on dry sandy soil exposed to winds.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Apparently endemic to Greenland and the American Arctic Archipelago (PORSILD, Ill. Fl., p. 99, map 195). In Greenland, according to PORSILD (l. c.; cf. also BHJ., p. 113), it is known on the north and extreme northwest coasts, on the west coast from Disko southward to about lat. 66°, and on the northeast coast between lats. 72°12′ and 76°.

### *Draba crassifolia* GRAHAM

Apparently rare or infrequent in the Mesters Vig district. It was seen in a single locality, on the front of a large till gelifluction lobe at an altitude of about 660 m on the north slope of Hesteskoen. There it was growing in moist turf, in a relatively dense vascular plant cover of grasses, sedges and heaths. Its surficial substratum in this site probably is fairly stable, though subject to mass flowage and fracture.

Notes made by SØRENSEN (1933, p. 44) and GELTING (1934, p. 72–3) indicate that the species is rare elsewhere in the fjord region also. GELTING merely calls it a snow-patch plant. SØRENSEN listed it in a single, moderately moist ecosystem: Herb mats on sheltered sunny slopes. From his description this site is not unlike that in which the plant was found at Mesters Vig.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Considered by PORSILD (Ill. Fl., p. 95, map 184) as a North American, primarily subarctic and alpine species with apparently isolated areas in east and west Greenland, northern Labrador, northern Hudson Bay, southern Baffin, the northern Cordillera, and the Mackenzie Delta region. HULTÉN, on the other hand (Amph. Pl., p. 192, map 174), adds localities in northern Norway, and thus makes the species amphi-Atlantic (cf. also SEIDENFADEN & SØRENSEN, 1937, p. 172). On the west coast of Greenland it is found approxi-

mately between lats. 64° and 74°, and on the east coast between lats. 66°8′ and 74°11′ (BHJ., p. 116; Porsild, l. c.; Böcher, 1954, p. 115, fig. 29).

***Lesquerella arctica*** (Wormskj.) Wats.

Apparently rare in the Mesters Vig district. It was found on a steep south-facing ledgy slope on the shore of the small bay called Noret, and was collected by Gudmundsson and Björnsson in the vicinity of Nyhavn in 1955 (Herb. H. R.). It was in relatively dry, moderately stable soil, in a vascular plant coverage of about 40%.

Gelting (1934, p. 82–3) stated that this species preferred gravel in warm localities, with the elements of xerophilous grass heaths. Sørensen (1933, p. 46–7) found it in dry places open to the wind, and in places with solifluction. In 1937 (p. 113) he listed it in three ecosystems, all of them in dry series. Oosting (1948, p. 259–63) noted it on newly formed sand slopes, and on sand plains and dunes. These observations, taken together, indicate that the species occurs in a considerably wider range of vegetative coverages than the Mesters Vig notes indicate, that it is a consistent xerophyte, and that it can survive some physical disturbance due to gravity displacement and wind deflation. It is probable that the solifluction areas noted by Sørensen did not involve the surficial soils.

Chamaephyte, with taproot (Gelting, 1934, p. 291).

Geographic distribution: *Lesquerella arctica*, sens. lat., is primarily a species of North America and Greenland, but has one area in northern Asia, in the lower Olenek–lower Lena River region (Hultén, Fl. Al., p. 841–2; Porsild, Ill. Fl., p. 94, map 183). In continental America it has a subarctic phase known as ssp. *Purshii*. In Greenland it is known in all the northerly coastal districts, southward in the east to Scoresby Sund, and in the west to Disko Bugt, with an isolated area about lat. 66°30′ (BHJ., p. 118; Böcher, 1954, p. 135, fig. 33; Porsild, l. c.).

***Cochlearia officinalis*** L. ssp. ***groenlandica*** (L.) A. E. Pors.

*Cochlearia groenlandica* L.

Occasional to common on tidal sandy beaches protected from intensive wave and ice action. Vegetative coverage is low on all the Mesters Vig beaches, and this species was always found in open stands (10% or less). It has to withstand the rigors of an extremely short growing season as well as some disturbance by waves and ice.

Observations elsewhere in the fjord region indicate that this species is not restricted to the sea beaches. Gelting (1934, p. 65–7) reported it below bird stones, and Sørensen (1933, p. 43) noted in it damp clay

and sand far from the coast. In 1937 (p. 112) he listed it in two noncoastal moist to wet ecosystems: Sheltered sunny slopes and patches, and Snow-patches and polygon soils.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: *Cochlearia officinalis*, sens. lat., is usually regarded as a circumpolar species (PORSILD, Ill. Fl., p. 92; POLUNIN, Circ. Fl., p. 226). Some students have considered ssp. *groenlandica* as amphi-Atlantic (LÖVE & LÖVE, 1956, p. 123), but there is a possibility that it is a circumpolar arctic segregate (cf. HULTÉN, Amph. Pl., p. 13–14; JSW., p. 65–6; PORSILD, l. c.). It is known in all of the main coastal districts of Greenland (BHJ., p. 117–8; PORSILD, l. c., map 177; SEIDENFADEN & SØRENSEN, 1937, p. 172).

### ***Eutrema Edwardsii*** R. BR.

Found in a single locality in the Mesters Vig district, on the slopes of the Labben peninsula in the vicinity of experimental sites 2, 3 and 9. Here the slope is gentle, with sandy soils interspersed with non-sorted circles of clayey silt loam. The *Eutrema* was growing sparsely in the sandy areas, which were kept somewhat damp throughout most of the summer by moisture from thawing ground. The vascular plant coverage in the area ranges from 11 % to 20 %. The sands probably are relatively stable, though they may undergo considerable frost heaving in autumn in areas where enough moisture is available.

GELTING (1934, p. 81–2) found this species rather rare, occurring singly and very scattered in dry heaths. Notes made by SØRENSEN in 1933 (p. 46) say that it grows mostly in bogs with a substratum of moving soil, always singly or in small numbers. In 1937 (p. 113) SØRENSEN listed it in two moist to wet ecosystems: Earth glaciers and sliding slopes, and Solifluction clay. These notes suggest a slightly wider range on the moisture gradient than the Mesters Vig observations indicate, and they corroborate the species' capacity to live in disturbed soil, for SØRENSEN's Solifluction clay ecosystem is characterized by frost-heaved surficial soils.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 92–3; 1958, map 1; HULTÉN, Fl. Al., p. 819–20; POLUNIN, Circ. Fl., p. 236). In Greenland the species extends around the northern coasts, southward in the west to Disko Bugt, and in the east to Scoresby Sund (BHJ., p. 117; PORSILD, l. c., map 178; SEIDENFADEN & SØRENSEN, 1937, p. 172).

### *Braya purpurascens* (R. Br.) Bge.

Occasional to common in moist to dry sandy or silty soils, but sometimes found growing in turfy materials among mosses in rocky places at the bases of cliffs. In most sites it is in open vegetation, in coverages of less than 1% to 30%, but in turfy habitats it may be in more dense stands (50–60%). Although found in soils that appear to be essentially stable, such as those on the ancient river terraces near the mouth of Tunnelelv, it seems to flourish in disturbed soils. It grows, for example, on the most active surfaces, fronts, and lower lateral margins of small silt gelifluction lobes, and it appears in the intensively frost-heaved moist soils in the "trenches" between maturing turf hummocks.

Observations elsewhere in the fjord region corroborate the wide range of this species in the moisture and disturbance gradients, and also its relative position in the scale of coverage. Gelting (1934, p. 61–2) said that it preferred sandy, gravelly mineral soil, and that it was not found in closed vegetation. Sørensen in 1933 (p. 41) found it mostly in damp places where there was no cover of vegetation, in sandy as well as clayey soil. Among his ecosystems he listed it in both dry and moist to wet series (1937, p. 112), and in the latter he placed it in the surficially disturbed Solifluction clay.

Hemicryptophyte, with taproot (Gelting, 1934, p. 293).

Geographic distribution: Circumpolar, but with a much disrupted range in northern Eurasia (Hultén, Fl. Al., p. 888; Porsild, Ill. Fl., p. 102; Polunin, Circ. Fl., p. 218). In Greenland it is known in the more northerly coastal districts, southward in the west to Disko Bugt, and in the east to Scoresby Sund (BHJ., p. 119; Porsild, l. c., map 201).

### *Cardamine bellidifolia* L.

Occasional in the organic substrata of turf hummocks and the fronts of large till gelifluction lobes, but more common in sandy mineral soils that maintain appreciable moisture at the surface throughout the summer. These occur in shallow saucer-like depressions in the surfaces of the ancient delta remnants, or in old ice-wedge cracks in sandy surfaces, or in shallow depressions in the tops of trap knobs. This species commonly grows in open vegetation, in coverages ranging from less than 1% to 20%, but in damp sandy depressions it may be in much denser stands, from 30% to 60% coverage, or to as much as 90% on turf hummocks. It is capable of withstanding both desiccation and physical disturbance, for it grows on the upper sand beaches beyond reach of tides, where it is alternately buried and blown out by the movement of the sand. It also

grows on steep sliding banks of dry sand on south-facing slopes among the delta remnants.

Earlier observations in the fjord region indicate a range of habitats in the moisture and coverage gradients somewhat similar to that at Mesters Vig, but not extending to the sandy beaches and dry sandy slopes. GELTING (1934, p. 63–4) found the species in damp places in dwarf-shrub heaths, meadows and bogs, but most frequently in bogs. SØRENSEN noted it (1933, p. 42) in damp dwarf-shrub vegetations and in snow-patches. In 1937 (p. 112) he listed it in two moist to wet ecosystems: Sheltered sunny slopes and patches, and Snow-patches and polygon fields.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 94; HULTÉN, Fl. Al., p. 832–3; POLUNIN, Circ. Fl., p. 223). In Greenland it is known in all the coastal districts with the possible exception of the southernmost tip (BHJ., p. 123; PORSILD, l. c., map 180; SEIDENFADEN & SØRENSEN, 1937, p. 172; GRÖNTVED, Fl. Icel., p. 244–5; BÖCHER, 1954, p. 177, fig. 47).

### *Arabis alpina* L.

Common in the loose sandy-gravelly soils along the watercourses of mountain streams. These sites are subject to heavy flooding and scouring by ice and slush each year, but this species was not seen anywhere except in such places. For a short time in spring they are wet, but they soon become very dry, and always have a low vegetative coverage (10% or less).

GELTING (1934, p. 56–7) noted this species as rare and made no comments on its habitat. SØRENSEN, working in the southern part of the region, apparently also found it infrequent (1933, p. 38). He found it mostly on sandy river banks, an observation consistent with the notes made at Mesters Vig. In 1937 (p. 137), however, he listed it in a single, moderately moist ecosystem: Herb mats on sheltered sunny slopes. This considerably extends the range of the species in the coverage gradient.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Amphi-Atlantic, with extensions westward to Labrador, Hudson Bay and southern Baffin Island, and eastward to Novaya Zemlya, northern Russia and northern Scandinavia (HULTÉN, Amph. Pl., p. 50, map 31; PORSILD, Ill. Fl., p. 100; 1958, map 5). In Greenland it is a southern species, extending northward on the west coast to about lat. 73°, and on the east to about 74°30′ (PORSILD, l. c., map 196; BHJ., p. 124).

### ***Sedum Rosea*** (L.) SCOP.

*Rhodiola Rosea* L.

Common on ledges and in crevices on the trap and sandstone ridges and mountains. It appears to be most frequent in the drier of these sites, and is usually in mixture with other species to form rather dense coverages in local areas. Almost by definition these sites are comparatively stable, though occasionally the *Sedum* is found on relatively loose sandy soil on dry ledges, and must withstand the effects of creep.

Observations elsewhere in the fjord region by GELTING (1934, p. 55–6) and SØRENSEN (1933, p. 38; 1937, p. 112) are consistent with those at Mesters Vig.

Chamaephyte, with taproot (GELTING, 1934, p. 292).

Geographic distribution: The yellow-flowered forms of *S. Rosea* probably should be considered a circumboreal aggregate of more or less poorly defined segregates, and many discontinuities of range (cf. HULTÉN, Amph. Pl., p. 52, maps 33, 34; POLUNIN, Circ. Fl., p. 246; SEIDENFADEN & SØRENSEN, 1937, p. 171). Some students have regarded them as an amphi-Atlantic complex with their largest area in Eurasia (PORSILD, Ill. Fl., p. 103; cf. also HULTÉN, l. c.). In Greenland the species is known in all the southerly coastal districts northward in the west to Disko Bugt, and in the east to about lat. 75°30′ (BHJ., p. 82).

### ***Saxifraga oppositifolia*** L.

One of the commonest vascular plants in the Mesters Vig district, to be grouped with such species as *Salix arctica*, *Polygonum viviparum*, *Silene acaulis*, *Dryas octopetala* and several others in its capacity to live in a wide variety of habitats. On the moisture gradient it is to be found toward the moist end in wet moss-sedge meadows and hummocky wet meadows; and on moist mountain slopes it grows in both heath and sedge tundra. Toward the drier end of the gradient it grows on dry stony till knolls, in loose grus on the tops of trap knobs and ridges; and on the clayey silt loams of the slopes bordering the fjord it survives the intense desiccation of the surface soils in summer. In one habitat or another it was noted in nearly every vegetative coverage category, from less than 1 % to 90 %. It is so common in so many kinds of sites that only a rather elaborate statistical study would suggest the kind of place in which it grows most profusely. Ocular estimates put this place at about the middle of the moisture gradient, in a vascular plant coverage of 20–40 %. The capacity of this species to withstand disturbance to its root system is almost, if not entirely, as great as that of the species noted above. It is found in the centers of the most active sorted nets, and on surfaces, fronts and lower lateral margins of small, active silt gelifluction lobes.

It was also growing in apparently active debris islands, both in the vicinity of Myggesø and on the summit of Hesteskoen. On the large till gelifluction lobes it grows in the actively moving soils of the upper surfaces. On the higher sea beaches, beyond reach of ordinary high tides, it is alternately blown out by the wind and covered by blown sand. It grows on the lowest river terraces along Tunnelelv, where the surfaces are subject to severe flooding each year; and it was found in the scoured stony channels of small mountain streams that carry heavy loads of water and slush each spring at thaw season. It also seems able to survive displacement by sliding soil, for it was found in the loose soil on dry ledges, and on fresh debris at the foot of an undercut river bank. It grows as a weed in the disturbed soils around habitations.

The wide tolerance of this species in the moisture and coverage gradients has been observed repeatedly, but there is little in the earlier habitat notes on its relation to disturbance factors. SØRENSEN in 1933 (p. 85–6) noted it in both dry and in damp soil. GELTING in 1934 (p. 128) found it especially on dry soil, and rarely in constantly damp, closed plant associations such as mossy bogs. In 1937 (p. 114) SØRENSEN listed it in only four ecosystems, three of them in the dry series and one in the moist to wet. GELTING, as a result of his detailed studies of ptarmigan foods, seems to have gained a larger appreciation of its range of habitats. He wrote as follows (1937, p. 33): "The species is exceedingly common within the area, and on account of its wide amplitude in the various ecological scales may be found anywhere and at all seasons of the year. It enters into a large number of plant communities as a subordinate species."

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 108; HULTÉN, Fl. Al., p. 926–8; POLUNIN, Circ. Fl., p. 260). Known in all the coastal districts of Greenland (BHJ., p. 93; PORSILD, l. c., map 217).

### *Saxifraga Nathorstii* (DUSÉN) HAYEK

Occasional or locally common on damp sandy soils, mainly on the wide gravel flats and river terraces formed at the mouth of Tunnelelv. It was rarely seen outside this area, and then only in somewhat similar sites such as low terraces along Tunnelelv about 2 km. up its valley, and in a stony stream channel on the lower north slope of Domkirken. In the latter two situations it was in soils much disturbed by seasonal flooding, but on the broad terraces below its soils probably are relatively stable. In all cases it was found in open vascular plant coverages (1–20%).

Habitat notes on this species made elsewhere in the fjord region are in general agreement with the above, though according to GELTING

(1934, p. 125–6) it may be found in bogs and damp heaths as well as on river gravels. SØRENSEN in 1933 (p. 77–84) noted in on moist ground, especially in riverbeds and desiccated ponds. He also found it on sandy-clayey river deltas. In 1937 (p. 114) he listed it in a single, moist to wet ecosystem: Fresh alluvial flats.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: Apparently endemic to Northeast Greenland, known in the fjord region from Scoresby Sund to about lat. 75°18′ (BHJ., p. 93–4; SEIDENFADEN & SØRENSEN, 1937, p. 174; cf. also JSW., p. 76–7).

### *Saxifraga foliolosa* R. BR.

*Saxifraga stellaris* L. var. *comosa* POIR.

Apparently rare in the Mesters Vig district. Where found it was growing in wet soil, mostly in thin moss mats bathed in water flowing in mountain streams or in sheet-flow areas. It was in sites with low vascular plant coverage (11–20%), and in soils that were surficially disturbed either by flooding or gelifluction. It was growing, for example, on the moving surface of a large till gelifluction lobe at an altitude of about 660 m on the north slope of Hesteskoen.

The Mesters Vig observations, though scanty, appear representative of those elsewhere in the fjord region. GELTING (1934, p. 129–30) found the species mainly restricted to damp soil, frequent in mossy bogs and snow-patches. SØRENSEN (1933, p. 87) noted it in wet soil, especially in spots without vegetation, among the knolls in bogs, and in wet gravelly snow-patches. Among his ecosystems (1937, p. 114) he listed it in three appropriate ones in the moist to wet series. It is notable that one of these three is Solifluction clay, the surficial soils of which are actively disturbed.

Hemicryptophyte, with short vertical rhizome and fibrous adventitious roots (GELTING, 1934, p. 129–30, 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl.. p. 107; HULTÉN, Fl. Al., p. 917; Amph. Pl., p. 110, map 92; POLUNIN, Circ. Fl., p. 260). In Greenland it is known in all the coastal districts except those at the southeast. It reaches its southern limit on the east coast at Kap Dalton, lat. 69°25′ (BHJ., p. 89; PORSILD, l. c., map 213).

### *Saxifraga hieracifolia* WALDST. & KIT.

Occasional or common very locally in wet moss-sedge meadows and hummocky wet meadows. It reaches greatest abundance in thick moss mats at the margins of shallow lakes which are the haunts of large numbers of geese. Here the mosses are heavily fertilized and grow to

unusual thickness. *Saxifraga hieracifolia* is not entirely limited, however, to these wet meadow sites, for it was found growing in the centers of large, apparently active sorted nets near a small lake in the vicinity of the south end of Danevirke. Thus it is found in both open and dense vegetations, and in both disturbed and relatively stable surface materials.

GELTING (1934, p. 123) found this species on damp soil, generally on "tufts of the bogs containing *Salix arctica*." SØRENSEN in 1933 (p. 76–7) noted it in or damp damp or wet soil, mostly among mosses. In 1937 (p. 113) he listed it in a single, moist to wet ecosystem: Sheltered sunny slopes and patches.

Hemicryptophyte, with short vertical rhizome and adventitious roots (GELTING, 1934, p. 123, 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 107; HULTÉN, Fl. Al., p. 918–20; POLUNIN, Circ. Fl., p. 260). It is strange that this wide-ranging species should be limited, in Greenland, to an area on the northeast coast between Scoresby Sund and about lat. 74°30′ (BHJ., p. 87).

### ***Saxifraga nivalis*** L.

Occasional to common in a variety of sites ranging from moist to relatively dry, but most frequent in the drier portion of the moisture gradient. It grows in the moist turf of the lower and lateral fronts of large gelifluction lobes, and in dàmp sandy soils kept moist during the summer by water from melting snow and thawing ground. On the ancient delta remnants it grows in the dry sands of low knolls on the upper surfaces, in areas where sand is now being deposited by the wind, and on steep banks of sliding sand on south-facing slopes. Similarly dry sites inhabited by it are in the loose stony grus on the tops of trap ridges. In the vascular plant coverage gradient it is found in nearly all categories, from 1% to 90%. Apparently it can survive a great deal of physical disturbance to its root systems. It grows in the duned sand of the upper sea beaches beyond reach of ordinary high tides, in debris islands on the summit of Hesteskoen and also at lower altitudes, and in the unstable soils of sliding sand banks as already noted. Also it survives and flourishes on the actively moving surficial soils on the tops of large till gelifluction lobes. It is a weed in the disturbed soils around habitations.

Observations elsewhere in the fjord region on the range of this species in the moisture and coverage gradients are consistent with those at Mesters Vig, though there is little in them to indicate its relation to factors of disturbance. GELTING (1934, p. 126–7) found it on dry soil, and on damp clayey or sandy soil. SØRENSEN (1937, p. 114) listed it in dry ecosystems: Barren ground, Bird places, and Sunny slopes; and in one of the moderately moist series: Sheltered precipices and rock ledges.

Hemicryptophyte, with short oblique rhizome and adventitious roots (GELTING, 1934, p. 126–27, 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 108; HULTÉN, Fl. Al., p. 924–25; POLUNIN, Circ. Fl., p. 260). Known in all the coastal districts of Greenland (BHJ., p. 87; SEIDENFADEN & SØRENSEN, 1937, p. 174).

### *Saxifraga tenuis* (WAHLENB.) H. SM.

*Saxifraga nivalis* L. var. *tenuis* WAHLENB.

Occasional in hummocky wet meadows and on moist sandy soils kept damp during the summer by water from melting snow or thawing ground. It was also found on the turfy fronts of large till gelifluction lobes. In these habitats it is in vegetative coverages ranging from 20% to 90 %, and on soils that are relatively stable in the upper 10–15 cm. An exception may be in the damp sandy loams which undergo frost heaving in autumn if enough moisture is available. Many of the organic soil sites are subject to mass flowage.

According to GELTING (1934, p. 127) and SØRENSEN (1933, p. 84–85; 1937, p. 114) this species is most common in open vegetation, and GELTING states that it grows exclusively on damp bare ground. SØRENSEN, however, listed it in two moist to wet ecosystems that might involve considerable density of vegetation: Snow-patches and polygon fields, and Constantly irrigated fields.

Hemicryptophyte, with short oblique rhizome and adventitious roots (GELTING, 1934, p. 127, 295).

Geographic distribution: Regarded by PORSILD (Ill. Fl., p. 109) as amphi-Atlantic. HULTÉN (Fl. Al., p. 925) thought it only a minor form appearing here and there within the range of *S. nivalis*, but more recent studies, involving chromosome counts, indicate that it is apparently a valid entity (cf. JSW., p. 77–8). It is known in all the coastal districts of Greenland (BHJ., p. 87–8).

### *Saxifraga aizoides* L.

Occasional to common, in sites ranging from wet to relatively dry, but most frequent in soils that remain moist throughout most of the summer. Found in hummocky wet meadows and in heath tundra on moist mountain slopes, but it is perhaps most common on sandy or silty soils that are kept moist during the summer by water from melting snow or thawing ground. However, it withstands considerable desiccation on the drier parts of the upper gravel terraces at the mouth of Tunnelelv, and on the sandy terraces just above ordinary summer high water level in this river. Also it is found on the upper surfaces of active

slushflow fans, which are composed mainly of sand and gravel, and become excessively dry in summer. Among these sites it grows in vegetative coverages ranging from less than 1 % to 90 %, and it has considerable capacity to survive disturbance. It grows on the active surfaces, fronts and lower lateral margins of small silt gelifluction lobes, and in the scoured stony channels of small mountain streams that are subject to violent flooding in spring. The low terraces along the main rivers are also flooded vigorously each year. On the slushflow fans the plants are displaced at less frequent intervals, but probably more violently when the disturbances do occur.

Observations elsewhere in the fjord region, taken together, suggest those at Mesters Vig for the behavior of this species on the moisture and coverage gradients, and by inference, perhaps on the disturbance gradient also. GELTING (1934, p. 118–19) thought it was almost restricted to damp heaths or bogs that nearly dry up in the course of the summer. SØRENSEN (1933, p. 74–75) noted it in damp soil, especially in river beds and in other places flooded in the early summer. In 1937 (p. 136, 138) he listed it in two moist to wet ecosystems: Fresh alluvial flats, and Seasonally submerged alluvial meadows.

Chamaephyte, with creeping stems and fibrous adventitious roots (GELTING, 1934, p. 118–19, 290).

Geographic distribution: Amphi-Atlantic (PORSILD, Ill. Fl., p. 105; HULTÉN, Amph. Pl., p. 44, map 26). In eastern Greenland it extends from lat. 65°38′ to about lat. 75°10′, while on the western coast it is known in all the districts, from the southern tip to about lat. 78° (BHJ., p. 92–93; PORSILD, l. c., map 206; SEIDENFADEN & SØRENSEN, 1937, p. 174).

### *Saxifraga cernua* L.

Common to abundant in a wide variety of sites, ranging from wet to dry, from dense vegetative coverage to open, and from relatively stable surficial soils to the most disturbed. Probably it is most abundant in damp sandy soils kept moist during the summer by water from melting snow or thawing ground. It is found occasionally in wet moss-sedge meadows, hummocky wet meadows, and on both growing and deteriorating turf hummocks. On moist mountain slopes it grows sparsely in dense heath tundra. It is abundant in the damp sandy soils on the lower slopes of the mountains, and in saucer-like depressions in the tops of the ancient delta remnants. In the drier parts of the moisture gradient it is common in the dry sands and gravels on the upper slopes of slushflow fans, on the steep slopes of dry south-facing river bluffs, and in stony-sandy soil on dry south-facing ledges among the trap and sandstone ridges. On the silt loams of the slopes bordering the fjord it sur-

vives the extreme summer desiccation of the surface materials. Where growing in the organic soils its substrata are relatively stable though often subject to mass flowage, especially on the fronts of large till gelifluction lobes where these soils fracture into blocks and fall. But the species grows also in the active centers of sorted nets, and on the active surfaces of small silt gelifluction lobes. It was seen in apparently active debris islands in the vicinity of Myggesø and on the summit of Hesteskoen. On the large till gelifluction lobes it is common in the actively moving surface soils of the tops. It appears capable also of surviving intense flooding, for it grows in the stony-sandy watercourses of small mountain streams that carry large quantities of water and slush during the spring thaw. Likewise it is common on the lowest terraces along the main rivers such as Tunnelelv, just above the ordinary summer water levels, where its site is heavily flooded during the spring thaw. Apparently it can survive violent displacement, for it was found growing in the debris of a new landslide below an undercut river bank; and its presence in the fresh material on the upper parts of slushflow fans indicates the same thing. In some of its driest sites it is found in vegetative coverages of 1 % or less, while in its organic substrata it may be in coverages of as much as 90 %. It is a common weed in the disturbed soils around habitations.

Gelting (1934, p. 120–1) noted this species in a large number of plant associations, and wrote that it did "not seem very dependent on moisture." Sørensen in 1933 (p. 75–6) found it on both dry and damp soils, also in snow-patches. He observed that it endured severe drought in late summer. However, he listed it in only three ecosystems, all in the moist to wet series (1937, p. 113). There is very little in these earlier notes from which to derive the plant's wide range of tolerance in the disturbance gradient.

Hemicryptophyte, with short vertical rhizome and fibrous adventitious roots (Gelting, 1934, p. 120–1, 294).

Geographic distribution: Circumpolar (Porsild, Ill. Fl., p. 106; Hultén, Fl. Al., p. 910–11; Polunin, Circ. Fl., p. 260). Known in all the coastal districts of Greenland (BHJ., p. 90; Porsild, l. c., map 211).

### *Saxifraga rivularis* L.

Apparently rare in the Mesters Vig district, and seen only on sheltered sandy sea beaches, where it occurs as widely scattered individual plants.

This species seems to be rather common elsewhere in the fjord region, judging by the notes of other observers. Gelting (1934, p. 129) merely noted it as a hygrophyte. Although Sørensen found it at the sea shores, he emphasized its presence in snow-patches (1933, p. 86–7; 1937, p. 114).

Hemicryptophyte, with short vertical rhizome and fibrous adventitious roots (GELTING, 1934, p. 129, 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 109; HULTÉN, Fl. Al., p. 935–6; POLUNIN, Circ. Fl., p. 261). Known in all the coastal districts of Greenland (BÖCHER, 1954, p. 177, fig. 47; BHJ., p. 90–1).

### *Saxifraga caespitosa* L.

Occasional, or common very locally, on damp to relatively dry sites, usually in sandy soils, and in low vegetative coverages (1–10 %). On moist sites it may be found in more dense vegetation (31–40 % coverage), but it is more frequent in the drier part of the moisture gradient. Further, it usually inhabits soils that are surficially disturbed, such as scree slopes, low river terraces that are just above ordinary summer water levels and therefore subject to frequent flooding, and the loose sandy soils of dry ledges among the trap ridges. It was also growing in the apparently active centers of debris islands on the summit of Hesteskoen.

Habitat notes made on this species by others are in essential agreement with those from Mesters Vig. GELTING (1934, p. 119–20) thought it preferred sandy or gravelly soils which dry up early, and he noted that it was frequent in river deltas. SØRENSEN (1933, p. 75) found it mostly on dry slopes that become free of snow early in spring, but also in shadow below mountain walls. In 1937 (p. 113) he listed it in three ecosystems ranging from Barren ground in the dry series to Sheltered sunny slopes and patches in the moist to wet.

Chamaephyte, with taproot (GELTING, 1934, p. 290).

Geographic distribution: *Saxifraga caespitosa*, sens. lat., is a circumpolar aggregate, in which the typical species (ssp. *caespitosa*) is regarded by some students as circumpolar (HULTÉN, Amph. Pl., p. 96, map 78), and by others as amphi-Atlantic (PORSILD, Ill. Fl., p. 105–6, map 208). In Greenland the species, sens. lat., is known in all the coastal districts (BHJ., p. 91).

### *Sibbaldia procumbens* L.

Occasional, or common very locally in heath tundra on moist mountain slopes. Where found it was in rather dense vascular plant coverages (60–90 %), in surficial soils that were largely of turf and relatively stable though subject to mass flowage. This was especially true where it was growing on the fronts of large till gelifluction lobes, in masses of turf that were breaking off and falling.

GELTING did not see this species in the area in which he worked, but SØRENSEN's notes (1933, p. 72; 1937, p. 137) are consistent with those made at Mesters Vig.

Chamaephyte or Hemicryptophyte (BÖCHER, 1938, p. 137) with branching rhizome and fibrous adventitious roots.

Geographic distribution: Circumpolar, but with large discontinuities in its range (HULTÉN, Amph. Pl., p. 236, map 217; PORSILD, Ill. Fl., p. 115). In Greenland it is a southern species, extending northward on the west coast to about lat. 72°, and on the east coast to about 73° (BHJ., p. 79; PORSILD, l. c., map 234; BÖCHER, 1954, p. 79, fig. 21).

### ***Potentilla nivea*** L.

Represented in the Mesters Vig district by the typical form, *P. nivea* s. str., by ssp. *Hookeriana* (LEHM.) HIITONEN, and possible by ssp. *Chamissonis* (HULTÉN) HIITONEN. There has been much difference of opinion, expressed or implied, in the literature on the Greenland relatives of *P. nivea*. HULTÉN (1945) recognized three forms there: *P. nivea* s. str., its ssp. *subquinata*, and *P. Chamissonis*. He made *P. Chamissonis* an amphi-Atlantic species ranging from the eastern Canadian Arctic to Spitzbergen and northern Scandinavia. *Potentilla Hookeriana* he regarded as a complementary species ranging westward from western North America to eastern Europe (cf. HULTÉN, l. c., figs. 6, 7, 8; Amph. Pl., p. 26). PORSILD (Ill. Fl., p. 113–14, maps 229, 230), though he made *P. Chamissonis* and *P. Hookeriana* both subspecies of *P. nivea*, followed HULTÉN in their definition and in the general disposition of their ranges. In Grønlands Flora (1958, p. 75–6) BÖCHER, HOLMEN and JAKOBSEN reinstated *P. Hookeriana* in Greenland, giving it a rather wide range on both east and west coasts, along with *P. Chamissonis* which they considered a subspecies of *P. Hookeriana*. JØRGENSEN, SØRENSEN and WESTERGAARD (1958), on the other hand, apparently followed HULTÉN, for they mentioned only *P. nivea* (with its ssp. *subquinata*) and *P. Chamissonis* in the Greenland flora.

The characters by which the three forms at Mesters Vig usually are distinguished are in the hairs and pubescence of the petioles. In *P. nivea* the pubescence is of short, soft, white hairs. In ssp. *Hookeriana* there are, in addition to this soft pubescence, long, stiff, divergent "guard" hairs. In ssp. *Chamissonis* the long, stiff, divergent hairs are present, but the short pubescence on the petioles is lacking. In all of the Mesters Vig collections except no. 461 both fine pubescence and long divergent hairs are present and abundant. In no. 461 the fine pubescence is present but sparse, thus approaching ssp. *Chamissonis*. The long divergent hairs were noted in the field on all the others, and it was assumed that they all represented ssp. *Hookeriana*. However, there is a distinct difference in the nature of these "guard" hairs. Though all are more or less divergent, those of some plants are soft and thread-like, often merging

with the fine pubescence beneath. These plants are to be regarded as *P. nivea* in the strict sense. In ssp. *Hookeriana* the long hairs are stiff, nearly straight, considerably thicker than in *P. nivea*, and appear almost indurated.

As already mentioned, these segregates were not well understood when the collections were made; consequently habitat differences or similarities that may occur among them must be derived from the somewhat scanty notes found on the sheets. Study of these notes suggests that at least the first two of the segregates (*P. nivea* and ssp. *Hookeriana*) occur in about the same kinds of habitats and have the same ranges of tolerance on the moisture, disturbance and coverage gradients. Of the collections made (ten field numbers), six are *P. nivea*, two are ssp. *Hookeriana*, one strongly suggests ssp. *Chamissonis*, and one appears to be a hybrid between *P. nivea* and some other species. On two occasions *P. nivea* and ssp. *Hookeriana* came from the same site, either in adjacent numbers (732, 732 A) or on the same date and close together in the numerical sequence (327, 354). The specimens that suggest ssp. *Chamissonis* (no. 461) come from the gravel terraces northeast of the Mesters Vig airfield, an area much frequented by geese and thus rather heavily manured. With these things in view, the following notes may be applied to *P. nivea* and ssp. *Hookeriana*. Whether they apply also to ssp. *Chamissonis* is uncertain.

Occasional to common in moist to relatively dry habitats, but most frequent in the latter. Commonly seen on dry, south-facing ledgy slopes, on gravelly talus, on sandy knolls among the ancient delta remnants, on the higher gravel terraces at the mouth of Tunnelelv, and in loose stony grus on the tops of trap knobs and ridges. In most of these sites it is in low vegetative coverage (11–20 %), but on the fronts of large till gelifluction lobes and at the bases of south-facing cliffs it is in more dense cover (30–40 %). These habitats are also its most moist sites. Most of its sites have relatively stable surficial soils, though on dry ledges and ledgy slopes the sandy materials are subject to creep, and on the large gelifluction lobes there is mass wasting on the fronts.

Habitat notes for this species made by GELTING and SØRENSEN in the fjord region were applied by them to *P. nivea* as an aggregate species, and no recognition of the above segregates was made by them. The following notes are presented on the same assumption of general similarity in habitat suggested in the preceding paragraph. GELTING (1934, p. 103–05) stated that the species preferred sandy or gravelly soil, and did not go far into snow-patches. He said it was common in dry and moderately damp plant communities, and that it preferred mineral to organic soil. SØRENSEN (1933, p. 61–64) found it in dry soil, common in places exposed to the wind. In 1937 (p. 113) he listed it in three dry

ecosystems: Disintegrating summits and crests, Bird places, and Clayey flats and raised beaches. These observations elsewhere in the region are generally consistent with those made at Mesters Vig.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: *Potentilla nivea* as defined here is essentially circumpolar (cf. HULTÉN, l. c.; PORSILD, l. c., maps 228, 229, 230). In Greenland it occurs in all the coastal districts except those of the extreme south and southeast (BHJ., p. 76; PORSILD, l. c.).

### ***Potentilla Crantzii*** (CR.) G. BECK

Common or locally abundant on moist ledges or at the bases of cliffs where the soils are kept damp through all or most of the summer by water from melting snow or thawing ground. It also grows in sandy soils on open mountain slopes provided adequate moisture from similar sources is available. On these open slopes it may be in low vascular plant coverages (11–20 %) but where most abundant on ledges and at cliff bases it is in dense coverages (61–90 %). The surficial soils in most of the above sites are relatively stable, though some of the sandy soils probably are subject to frost heaving in autumn. The species is also common on the turfy fronts of large till gelifluction lobes, where the surface materials are subject to rupture and mass flowage.

GELTING (1934, p. 101) found this species rather rare in his area, and growing in rich vegetation on slopes where a layer of humus had developed. SØRENSEN (1937, p. 137) placed it in a single, moderately moist ecosystem: Herb mats on sheltered sunny slopes. Thus the observations at Mesters Vig broaden its habitat range somewhat but do not greatly alter its known position in the moisture and disturbance gradients.

Chamaephyte, with short ascending rhizome and fibrous adventitious roots (GELTING, 1934, p. 101, 291).

Geographic distribution: Amphi-Atlantic with extensions into southern Baffin Island and Labrador, and eastward to Scandinavia, Novaya Zemlya and the Urals (HULTÉN, Amph. Pl., p. 46, map 27; PORSILD, Ill. Fl., p. 112; cf. also POLUNIN, Circ. Fl., p. 276). It is known in all the southern coastal districts of Greenland, reaching northward on the west coast to about lat. 72°, and on the east to about 74° (BHJ., p. 78; PORSILD, l. c., map 225).

### ***Potentilla hyparctica*** MALTE

*Potentilla emarginata* PURSH, not DESF.

Occasional on moist ledges and on the lateral and lower fronts of large till gelifluction lobes. It grows in sites somewhat similar to those

of *P. Crantzii*, but is much less frequent than that species, and appears to withstand greater desiccation in the surface soils. It was seen in vascular plant coverages ranging from 40 % to 90 %. The surficial soils in which it grows are relatively stable except for the mass flowage on the fronts of the gelifluction lobes.

Observations elsewhere in the fjord region give this species much wider tolerances in the moisture and coverage gradients than are indicated at Mesters Vig where it is not common. GELTING (1934, p. 101–03) wrote that it has a very wide amplitude in the moisture scale, and extends far into the snow-patches. SØRENSEN (1937, p. 113) listed it in two dry ecosystems: Barren ground and Bird places, and in two moist to wet ones: Sheltered sunny slopes and patches, and Earth glaciers and sliding slopes.

Chamaephyte, with taproot (GELTING, p. 291).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 113; HULTÉN, Fl. Al., p. 1015–17; POLUNIN, Circ. Fl., p. 276–77). The species is northern in Greenland and ranges around all the northern coasts, southward in the west to about lat. 67° and in the east to about 66° (PORSILD, l. c., map 227; BHJ., p. 76–8; SEIDENFADEN & SØRENSEN, 1937, p. 174, 196, fig. 58).

### ***Dryas octopetala*** L.

One of the most abundant and conspicuous flowering plants in the Mesters Vig landscape, it is so nearly ubiquitous that a description of the habitats in which it is found becomes merely a recital of nearly all the habitats the region affords. It is easier to say where it does *not* grow, such as in the free water of streams and lakes, or on tidal beaches, or on the most thoroughly washed river gravels. In terms of the moisture gradient it is found at all levels. In saturated moss-sedge meadows it is one of the first shrubs to appear, along with *Salix arctica*, as the small moss hummocks begin to form. At the other extreme it is one of the commonest species on the clayey silt loams of the slopes bordering the fjord, where the surface soils are dried to brittle hardness in summer. And it appears nearly everywhere in the gravelly and sandy sites on the ancient delta remnants, and in the loose grus on the tops of trap knobs, two site complexes that probably contain the driest habitats in the area. On the vegetative coverage gradient it is found in all densities that were recorded, from the thick tundra of moist mountain slopes to the nearly barren surfaces of the silts where the coverages were sometimes less than 1 %. As might be expected under these circumstances, the capacity of the species to survive physical disturbance is considerable. On the Labben peninsula it is the principal species forming sand dunes, and in the delta remnants it was not only withstanding a great deal of

deflation of its sand substratum by wind, but also was the main species holding a large area of depositing sand. It is common on dry steep ledgy slopes subject to creep of the sandy mineral soils, and at experimental site 16 it is one of the few plants capable of living in the grus of the sliding talus slope. It was found also on the surfaces, fronts and lower lateral margins of small active silt gelifluction lobes. Although not seen on the most actively disturbed river gravels, where only *Epilobium latifolium* could survive, it is common on the lowest terraces nearby which are heavily flooded each spring. The preceding summary suggests that *Dryas octopetala* may be more susceptible to injury by frost heaving than by other agencies. It was not seen in the centers of active sorted nets or debris islands, and it is not common in sandy or silty soils that are kept moist during the summer and thus are subject to frost heaving in the autumn.

The wide tolerance of this species has been described by other observers in the fjord region, especially by GELTING. In 1937 (p. 31–2) he wrote, "Like *Salix arctica*, *Dryas* has a wide amplitude in nearly all the ecological scales." He thought, however, that while *Salix arctica* was most prolific in moist habitats, *Dryas* seemed to thrive best in drier sites. SØRENSEN in 1933 (p. 58–59) expressed the same view, stating that it was most frequent in dry, but also occurred in damp soil, e. g., bogs. SØRENSEN did not give it so wide a range in his ecosystems (1937, p. 113), for he listed it only in four, two in the dry series and two in the moderately moist. There is little in these notes to indicate its relation to the disturbance factors. However, OOSTING's observations (1948, p. 257–8) suggest the capacity of the species to live in unstable soils, for he found it on talus and loose dry gravel slopes.

Chamaephyte, with long ligneous taproot (GELTING, 1934, p. 289).

Geographic distribution: Circumpolar except that it has not been found in western Greenland or the Canadian Arctic Archipelago (PORSILD, 1947, p. 184–5; JSW., p. 85). PORSILD, in his revision of the North American representatives of *Dryas* in 1947, regarded all the eastern Greenland plants as *D. punctata;* but the Mesters Vig material is clearly *D. octopetala*, and JSW. have shown that this is true of nearly all other specimens collected there. In Greenland the species appears to be restricted to the northeast coast from the Scoresby Sund region to about lat. 78° (BHJ., p. 71–2; SEIDENFADEN & SØRENSEN, 1937, p. 58).

### ***Empetrum hermaphroditum*** (LGE.) HAGERUP

*Empetrum nigrum* L. var. *hermaphroditum* (LGE.) TH. SØR.

Common locally in heath tundra, on turf hummocks, on moist mountain slopes, on damp ledges, and at the bases of cliffs where moisture

from melting snow and thawing ground is available throughout the summer. It appears in the moss-sedge mats of some wet meadows as the turf hummocks begin to form, but is only occasional on such sites. It was always found in dense vascular plant coverage (81–90 %), and growing in organic soils that were relatively stable surficially. However, many of these soils are subject to mass flowage and subsequent rupture.

SØRENSEN's notes on the habitat of this species are much like those made at Mesters Vig. In 1933 (p. 95–6) he found it mostly in damp soil, generally with *Cassiope tetragona*, and in 1937 (p. 113) he placed it in a single moderately moist ecosystem: Sheltered precipices and rock ledges. In addition to sites of this kind, however, GELTING (1934, p. 144–5) noted that it forms heaths over small areas in the inner fjords, and that it sometimes grows in loose sand, often to the extent that it is partially buried in drifting sand. Thus it apparently has a wider range in the moisture, coverage and disturbance gradients than the Mesters Vig observations indicate.

Chamaephyte, with ligneous taproot (GELTING, 1934, p. 289).

Geographic distribution: *E. hermaphroditum* is the arctic form of the circumpolar *E. nigrum*. Its flowers are polygamous, and it has twice as many chromosomes as *E. nigrum* (cf. JSW., p. 92). It also is regarded as circumpolar (PORSILD, Ill. Fl., p. 125–6; POLUNIN, Circ. Fl., p. 309–10). It is known in all the Greenland coastal districts except the north (BHJ., p. 172; PORSILD, l. c., map 255).

### ***Epilobium latifolium*** L.

*Chamaenerion latifolium* (L.) SWEET

Common to abundant in a wide variety of sites. It appears, even though sparingly, in saturated moss-sedge meadows, in hummocky wet meadows, on turf hummocks, and in dense heath tundra on moist mountain slopes. At the same time it grows in some of the driest sites in the area—in the loose stony grus on the tops of trap ridges, on dry stony till knolls, and on the clayey silt loams that are desiccated to brittle hardness in summer. On these loams it grows in extremely open coverages (from less than 1 % to 10 %), and it is most abundant in coverages ranging up to about 20 %. However, as noted above, it is found in much denser vegetation, in coverages of 50–90 %. In its capacity to survive physical disturbance the species shows extraordinarily wide tolerance. It grows in river gravels that are subject to intense flooding each year, and in which no other species is found. Likewise it survives the scouring by ice, slush and water in the stony channels of smaller mountain streams. On the Labben peninsula it grows among active sand dunes, and among the ancient delta remnants it is found in sand

blowouts on windward slopes. Also in the delta remnants it grows on steep south-facing banks of sand where the soil is barely at rest, and at experimental site 16 it survives in a creeping talus of dry grus derived from the trap cliffs above. It withstands periodic violent displacement, as shown by its appearance on fresh debris at the base of undercut river banks, and on the tops and upper slopes of slushflow fans. Disturbance by frost heaving and gelifluction, though no doubt injurious, does not eliminate it, for it is found on the surfaces of small active silt gelifluction lobes, in both borders and active centers of sorted nets, and in the apparently active centers of debris islands (summit of Hesteskoen). It is found in sandy soils kept moist throughout the summer by water from melting snow and thawing ground, and thus subject to frost heaving in autumn. It is a common weed in disturbed soil at road sides and around habitations.

GELTING (1934, p. 84) wrote of this species that it was common, especially in loose sand, apparently independent of moisture. SØRENSEN in 1933 (p. 47–8) found it in sandy soil, dominating physiognomically over large areas in river deltas. He also noted it on dry windswept hills. It is strange, on the other hand, that in 1937 (p. 113) he listed it in a single moist to wet ecosystem: Water-soaked ground. OOSTING (1948, p. 254–60) noted it on dry outwash gravel plains, talus slopes, in rock crevices, on newly formed glacial moraines, and in *Dryas*-sedge heaths. Taken together, therefore, these earlier observations corroborate much of the wide tolerance exhibited by this species at Mesters Vig.

Hemicryptophyte, with adventitious roots and subterranean runners; usually with a single root strongly developed (GELTING, 1934, p. 84, 292, 293).

Geographical distribution: Circumpolar (PORSILD, Ill. Fl., p. 126–27; HULTÉN, Fl. Al., 1151–4; GRÖNTVED, Fl. Icel., p. 298). Known in all the coastal districts of Greenland (BHJ., p. 99; PORSILD, l. c., map 257).

### ***Hippuris vulgaris*** L.

Occasional in the shallow water of small lakes. Where found it was growing in open stands, unmixed with other species.

Observations by GELTING (1934, p. 83), SØRENSEN (1933, p. 47; 1937, p. 113) and OOSTING (1948, p. 250) elsewhere in the fjord region are consistent with the above. GELTING noted that sometimes, at low water stages in shallow lakes, the plants were found growing on damp ground.

Helophyte, with a sympodial rhizome and many fibrous adventitious roots (GELTING, 1934, p. 83, 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 129; HULTÉN, Fl. Al., p. 1161–63; POLUNIN, Circ. Fl., p. 321). In Greenland

it is known in all the southerly coastal districts, and northward on both coasts to about lat. 77° (BHJ., p. 104; PORSILD, l. c., map 261).

### *Pyrola grandiflora* RAD.

*Pyrola rotundifolia* L. var. *grandiflora* (RAD.) DC.

Occasional or locally common in the damp heath tundra that is found on ledges or in sandy soils on till or trap knolls. It is most common in rather open heath, in coverages ranging from 6 % to 50 %, usually in patches of *Cassiope tetragona*; but it sometimes appears in the organic turfs of denser, more complex heaths. The open heaths on the sandy soils of the knolls and ridges lose much of their moisture during the summer, so that this species withstands a great deal of desiccation. The surficial materials in which it grows are relatively stable, though in sands that retain moisture throughout the summer there is some frost heaving in autumn.

Observations elsewhere in the fjord region are consistent with those at Mesters Vig. GELTING (1934, p. 153–4) found it in moderately damp soil, more frequently in *Vaccinium uliginosum* heath in his area than in other forms. SØRENSEN (1933, p. 104) gave its habitat in the southern part of the region as "dwarf shrub vegetations," and in 1937 (p. 136) he placed it in a single, moderately moist ecosystem: Sheltered precipices and rock ledges. OOSTING (1948, p. 252–53) mentioned it only once in his ecological notes, in what he called "mature moss mats."

Hemicryptophyte, with adventitious fibrous roots (GELTING, 1934, p. 295).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 130; HULTÉN, Fl. Al., p. 1209–12). It is known in all the western coastal districts of Greenland, northward to about lat. 79°, but on the east coast it is found between lat. 66°08′ and lat. 74°36′ (BHJ., p. 166; PORSILD, l. c., map 263; BÖCHER, 1954, p. 167, fig. 43).

### *Rhododendron lapponicum* (L.) WAHLENB.

Occasional or locally common in moist to damp heath tundra on ledges or moist mountain slopes. It is usually in dense vegetative coverages (81–90 %), mixed with *Dryas*, *Salix*, *Cassiope*, *Vaccinium*, and sometimes *Betula nana*. On sledgy slopes the soils may lose much of their moisture during the summer, indicating that the species can survive a considerable amount of desiccation. Most of its substrata are surficially stable, though many are subject to mass flowage.

SØRENSEN's notes on this species (1933, p. 99–100; 1937, p. 114) and also OOSTING's (1948, p. 249) are consistent with those made at

Mesters Vig. GELTING, however, (1934, p. 148–49), in addition to finding it in heaths and bogs, also recorded it on bare, gravelly dry soil. This greatly extends its range of tolerance in the moisture and coverage gradients.

Chamaephyte, with long taproot (GELTING, 1934, p. 148–49, 289).

Geographic distribution: Regarded by HULTÉN as amphi-Atlantic (Amph. Pl., p. 200, map 181) and by PORSILD as circumpolar (Ill. Fl., p. 132). It ranges around the Polar Basin westward from northern Scandinavia to the Yana River in northern Siberia, then southwestward into the central Asiatic mountains. In view of the large gap in northern Eurasia it is probably best looked upon as amphi-Atlantic. In Greenland it is known in nearly all the coastal districts except the north. Its northern limit on the northeast coast is given as lat. 77°37′ (BHJ., p. 170–1; PORSILD, l. c., map 270; SEIDENFADEN & SØRENSEN, 1937, p. 176).

### ***Cassiope hypnoides*** (L.) D. DON

*Harrimanella hypnoides* (L.) COVILLE

Locally common on wet mossy rocks along mountain streams, and in moist heath tundra. It was always found in these moist habitats, in rather dense vegetative coverages, and on sites with surficially stable substrata.

Both GELTING and SØRENSEN reported this species in only a few localities. GELTING (1934, p. 146–7) considered it rare in his area, and found on slopes with south exposure, in association with *Carex Bigelowii* (*C. rigida*) and *Salix herbacea*. He noted the soils in these sites as sandy and damp, "at times drying up considerably." SØRENSEN (1937, p.137, placed it in one moderately moist ecosystem: Herb mats on sheltered sunny slopes. These notes appear to extend the known tolerance of the species in the moisture gradient beyond that observed at Mesters Vig, for in the latter area is was not seen in sites that become dry in summer.

Chamaephyte, with ligneous taproot (GELTING, 1934, p. 290).

Geographic distribution: Amphi-Atlantic, with extensions westward in the Canadian Subarctic to eastern Mackenzie, and eastward in northern Eurasia to the mouth of the Yenisei River (HULTÉN, Amph. Pl., p. 34, map 15; PORSILD, Ill. Fl., p. 131; LÖVE & LÖVE, 1956, p. 146, fig. 8; cf. also POLUNIN, Circ. Fl., p. 339). Known in all the southerly coastal districts of Greenland, northward in the west to about lat. 74°18′, and in the east to about 74°07′ (BHJ., p. 168; GRÖNTVED, Fl. Icel., p. 313–4; PORSILD, l. c., map 267; BÖCHER, 1954, p. 111, fig. 28).

***Cassiope tetragona*** (L.) D. DON

This is by far the most abundant ericaceous shrub in the Mesters Vig district, and the principal component of the "heath" vegetation that covers large areas on moist mountain slopes. However, the species is found in a wide variety of sites which have broad ranges on the moisture, coverage and disturbance gradients. It appears early in the development of turf hummocks, when low mounds of mosses begin to rise above the general level in saturated moss-sedge meadows, and it remains a major element in the flora of the hummocks throughout much of their growth and deterioration. In this process the plants survive gradual desiccation of their organic substratum. Toward the other end of the moisture spectrum, *Cassiope tetragona* is abundant in the excessively drained sandy and gravelly soils of till knolls and the ancient delta remnants. In the latter it occurs everywhere except on the steepest slopes and on the smallest of the high remnant surfaces, commonly forming dense mats in nearly pure stands. Although it does not seem to have quite so much tolerance of disturbance as some other species, such as *Salix arctica*, *Dryas octopetala*, etc., some of its habitats suggest that it can withstand a good deal. In the delta remnants it becomes a "dune plant" on windward sandy slopes, alternately blown out and covered with sand. In areas of active sorted nets it is the commonest species at the stone borders, but a few plants survive in the heaved silty soils of the centers. It was found growing more successfully in the centers of sorted nets near the southern end of Danevirke, where the soils are somewhat more sandy. Likewise it was growing in the centers of debris islands in the vicinity of Myggesø. A few individuals of it were found surviving in the moving surface soils on the tops of large till gelifluction lobes on the mountain slopes. On the long gentle slopes bordering the fjord it grows on both sandy and clayey silt loam soils, some of which become dry and hard in summer, while others, particularly some of the sands near the bases of the hills, are kept moist by water from melting snow and thawing ground. Many of these sites probably are subject to frost-heaving in autumn, and the *Cassiope* grows sparingly on them. In moist heath tundra the species grows in dense coverages (up to 90%), and on the delta remnants it commonly forms mats with coverages of 50% to 70%. But in some of its disturbed habitats it is found in coverages as low as 1–6%.

Most of the earlier comments on the habitat of this species have been confined to its predominence in the heaths of the fjord region. SØRENSEN (1933, p. 98–9) merely noted that though this was its principal role in the vegetation, it also occurred in bogs. In 1937 (p. 114) he did not even mention the bogs, listing the species in only two eco-

systems, both in the moderately moist series: Sheltered precipices and rock ledges, and Well-drained fields. OOSTING (1948, p. 249, 251) mentioned it only in connection with turf hummocks and his "heath climax." GELTING's observations (1934, p. 147–8) make some notable additions to these comments, and suggest at least a part of the wider tolerance seen in the species at Mesters Vig. He said it was found principally on dry sandy mineral ground, and was not by far so frequent in the supra-aquatic parts of the bogs as most of the other dwarf shrubs.

Chamaephyte, with ligneous taproot (GELTING, 1934, p. 290).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 131; HULTÉN, Fl. Al., p. 1238–40). In Greenland it is known in all the northerly coastal districts, southward in the west to about lat. 65°, and in the east to the vicinity of Angmagssalik, about lat. 66° (BHJ., p. 168; PORSILD, l. c., map 268; BÖCHER, 1954, p. 167, fig. 43).

### *Arctostaphylos alpina* (L.) SPRENG.

Locally common or abundant on moist ledges or in heath tundra on moist mountain slopes. On some trap ledges it sometimes forms dense mats, to the exclusion of nearly all other plants. However, it is also found in sandy or silty soils kept moist during the summer by water from melting snow or thawing ground. Some of these sites become rather dry in late summer while others remain moist and probably are subject to frost heaving in autumn. The species also grows in dry sandy sites on gravel talus and in the ancient delta remnants, where it becomes a "dune plant" on windward slopes, alternately blown out by the wind and submerged by the windblown sand. On the sandy and silty sites it grows in open vegetation, in coverages as low as 6–10%, but on ledges and in heath tundra it is in coverages ranging up to 90%. Apparently it can survive a certain amount of disturbance by frost heaving, and a great deal by the deflation of its substratum.

Earlier notes on the habitat of this species in the fjord region emphasize its relation to dry sites rather than to moist ones. GELTING (1934, p. 145–6) went so far as to say that it was always found on extremely dry soil, often with *Betula* and *Empetrum*, or in xerophilous grass heaths with *Dryas*. He also noted that it could live in drifting sand. SØRENSEN (1933, p. 97; 1937, p. 136) described its habitat as dry sunny slopes. OOSTING (1948, p. 249, 260–3), however, listed it both in moist shrub heath vegetation (his heath "climax") and in the vegetation of sand plains and dunes.

Chamaephyte, with long ligneous taproot (GELTING, 1934, p. 289).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 132; HULTÉN, Fl. Al., p. 1244–7). In Greenland it has limited ranges on both

east and west coasts. On the east it is found approximately between lats. 68°45′ and 74°30′, while on the west it is between 65° and 70° (BHJ., p. 167; PORSILD, l. c., map 271; SEIDENFADEN & SØRENSEN, 1937, p. 176).

***Vaccinium uliginosum*** L. ssp. ***microphyllum*** LGE.

Common to abundant in a wide variety of sites ranging from wet to dry and characterized by open or dense vegetation. In saturated moss-sedge meadows it is one of the first shrubs to appear, and it becomes abundant in hummocky wet meadows, turf hummocks, and in moist heath tundra everywhere. But it is almost equally abundant in some of the driest habitats the region affords, on the sandy-gravelly tops of the excessively drained ancient delta remnants, and on dry stony till knolls. It also grows in the loose stony grus on the tops of trap knobs and ridges, and in the sliding grus of talus slopes among these ridges. On some of the grus habitats, and on the silt loams that dry out to brittle hardness in summer, it is in low coverages (1–5%), but in the heath tundra it is in coverages ranging up to 90%. On sandy and silty soils kept moist during the summer by water from melting snow and thawing ground it is often in intermediate cover (10–40%). Apparently it is able to survive slow creep in its substratum, for it is found in sliding grus, and on steep south-facing sand banks among the delta remnants where the soil is scarcely at rest. Also it can stand a certain amount of active inundation by blown sand, for it was found growing in an active depositional area in the delta remnants. It seems capable of withstanding some frost heaving, for it grows on sands and silts that go into the autumn frosts with enough moisture to permit heaving. It does not seem able to survive flooding, for it was not found in any habitat subject to this process. Many of its wetter sites are subject to mass flowage.

Although this species is common throughout the fjord region, earlier notes on its habitat are scanty. GELTING (1934, p. 149–50) confined his observations to its relation to snow cover, and made no comments on its position in the moisture and coverage gradients. SØRENSEN in 1933 (p. 100–1) stated that it occurred on fairly dry as well as in wet soil, frequently in bogs; but in 1937 (p. 114) he listed it in a single moderately moist ecosystem: Sheltered precipices and rock ledges. OOSTING (1948, p. 249, 251) saw it on turf hummocks and in his heath "climax," but did not mention it in any of the drier sites.

Chamaephyte, with ligneous taproot and abundant adventitious fibrous roots (GELTING, 1934, p. 149–50, 290).

Geographic distribution: *Vaccinium uliginosum*, sens. lat., is circumpolar (PORSILD, Ill. Fl., p. 132; POLUNIN, Circ. Fl., p. 344; HULTÉN, Fl. Al., p. 1258–61). The low-grown arctic form with small leaves, known

as ssp. *microphyllum* in Greenland and northern Europe, and as var. *alpinum* BIGEL. in America, probably also is circumpolar. The identity of the Greenland and northern American forms is assumed by some students (POLUNIN, Nat. Mus. Can. Bull. 92, p. 315, 1940; PORSILD, l. c., map 273), for there is close resemblance between them. The species occurs in all the coastal districts of Greenland. Though it has been found on the north coast it appears to be infrequent there (BHJ., p. 172; PORSILD, l. c.).

### ***Armeria maritima*** (MILL.) WILLD. ssp. ***labradorica*** (WALLR.) HULTÉN

*Armeria scabra* PALL. ssp. *sibirica* (TURCZ.) HYL.
*Armeria vulgaris* WILLD. var. *sibirica* (TURCZ.) ROSENV.

Apparently rare or occasional in the Mesters Vig district, where it was found only on dry sandy knolls in the ancient delta remnants. It was always in very low vegetative coverage (1–5 %), in soils that were surficially stable except for slight deflation by wind.

Notes made by other observers in the fjord region extend the range of this species in the moisture and coverage gradients. GELTING (1934, p. 151–2) sometimes found it in heaths, but mostly on bare gravel, especially near the beach. SØRENSEN (1933, p. 103) noted it in "not too dry" dwarf shrub vegetations; and in 1937 (p. 114) he listed it in one moderately moist and one moist to wet ecosystem, both containing some relatively dense vegetative coverages. Thus the species shows a wide tolerance in both moisture and coverage gradients, from very dry sites to quite moist ones, and from very low coverages to vegetation densities probably as high as 80–90 %. The surficial soils in the ecosystems used for it by SØRENSEN are relatively stable, though some of them may be subject to mass flowage.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: Essentially circumpolar except for a discontinuity in Yukon, Alaska and eastern Siberia where it is replaced by ssp. *arctica* (HULTÉN, Amph. Pl., p. 106, map 88). Because of this gap PORSILD (Ill. Fl., p. 134) has called its range amphi-Atlantic. In eastern Greenland it is known from about lat. 65°30′ to about 82°, and it is found in all the western coastal districts northward to about lat. 78°. It has been collected on the north coast, though sparingly (BHJ., p. 163–4; PORSILD, l. c., map 279; GRÖNTVED, Fl. Icel., p. 321).

### ***Gentiana nivalis*** L.

Apparently rare in the Mesters Vig district, and found only on rather dry, south- and southeast-facing, stony-sandy till slopes. It grows

in low vegetative coverages (6–20%), in surficial soils that are relatively stable, though on the steeper slopes they may be subject to creep.

This species does not appear at all in GELTING's notes on the central part of the fjord region, and SØRENSEN found it rare in the southern part (1933, p. 101). He noted it on a slope with a southern exposure, and in 1937 (p. 137) he placed it in a moderately moist ecosystem: Herb mats on sheltered sunny slopes. The observations are fairly consistent with those at Mesters Vig.

Hemicryptophyte (cf. BÖCHER, 1938, p. 166), with fibrous adventitious roots. Regarded by some students as a therophyte, but SØRENSEN 1933, p. 101) considered it a biennial.

Geographic distribution: Amphi-Atlantic, with an area on the northern Labrador coast, and an extension eastward to Iceland, Scandinavia and the central European mountains (HULTÉN, Amph. Pl., p. 116, map 97; cf. also PORSILD, Ill. Fl., p. 135). It is southern in Greenland, reaching northward from the southern tip to about lat. 71°30′ on the west coast. On the east coast it extends north approximately to lat. 68°30′, and then apparently has an isolated area in the fjord region to the northeast (72°10′–72°45′) (BHJ., p. 175; SEIDENFADEN & SØRENSEN, 1937, p. 176; GRÖNTVED, Fl. Icel., p. 324).

### *Veronica fruticans* JACQ.

Not found in the Tunnelelv valley or on the Nyhavn and Labben peninsulas, but collected by GUDMUNDSSON and BJÖRNSSON (Herb. H. R.) in the vicinity of Ekspeditionshus in Mesters Vig (bay).

This is a southern species on the East Greenland coast, and neither GELTING nor SØRENSEN made notes on its habitat. BÖCHER (1938, p. 178–9) summarized the latter on the southern coasts thus :"In dry places, especially in luxuriant herb-fields and *Empetrum-Vaccinium* heaths, also in open scrub."

Chamaephyte (BÖCHER, l. c.), with rhizome and fibrous adventitious roots.

Geographic distribution: Amphi-Atlantic, unknown in North America, but with areas in Iceland, Britain, Scandinavia and the Alps (HULTÉN, Amph. Pl., p. 88, map 70). In Greenland it is a southern species, ranging northward on the west coast to Disko, and on the east coast to Mesters Vig. The latter appears to be a range extension from about lat. 70°15′ (BHJ., p. 183; GRÖNTVED, Fl. Icel., p. 344).

### *Veronica alpina* L.

Apparently rare in the Mesters Vig district, and found only on moist mountain slopes in the vicinity of Myggesø and Ekspeditionshus in Mesters Vig (bay).

Sørensen (1933, p. 108) also noted it as rare in the southern part of the fjord region. In 1937 (p. 137) he listed it in a single moderately moist ecosystem: Herb mats on sheltered sunny slopes.

Hemicryptophyte (Böcher, 1938, p. 176), with slender rhizomes and fibrous adventitious roots.

Geographic distribution: Amphi-Atlantic, with extensions westward to southern Baffin Island and northern Labrador, and eastward to the northern Urals (Hultén, Amph. Pl., p. 54, map 35). It is known in all the southerly coastal districts of Greenland, northward in the west to about lat. 71°38′, and in the east to Mesters Vig (BHJ., p. 184; Hultén, l. c.; Gröntved, Fl. Icel., p. 342–3).

### ***Euphrasia arctica*** Lge.

*Euphrasia frigida* Pugsl.
*Euphrasia officinalis* L. in part.
*Euphrasia latifolia* Pursh of authors.

Common very locally in the Mesters Vig district. It grows in wet moss-sedge meadows and in sandy or silty soils that are kept moist during the summer by water from melting snow or thawing ground. On the other hand it is about equally common in thin, rather dry turf on south-facing sandy till slopes and river bluffs. In all of these sites it usually occurs in isolated patches within which there may be large numbers of individuals. It is found in vascular plant coverages ranging from 6% to 90%. The surficial soils in which it grows are relatively stable, though some of the fine-textured materials that retain moisture through the summer probably are considerably frost heaved in autumn. Many of its wetter sites are subject to mass flowage.

The range of this species in the moisture and coverage gradients noted at Mesters Vig is corroborated by earlier observations in the fjord region if these observations are taken together. Gelting (1934, p. 154–5) found it on warm slopes with south exposure, which dry up entirely during summer. He also noted the gregarious habit of the plant, and thought this due to "extremely rich fructification." Sørensen (1938, p. 105) said it grew mostly on grassy slopes free of snow in winter. In 1937 (p. 136) he placed it in a single moderately moist ecosystem: Fronts of earth glaciers. Oosting (1948, p. 252) found it in damp sand at the margins of drainage ways.

Therophyte, with taproot (Gelting, 1934, p. 298).

Geographic distribution: Amphi-Atlantic, with extensions westward to Labrador and Keewatin, and eastward to the Obi River in northwestern Asia (Porsild, Ill. Fl., p. 139; Hultén, Amph. Pl., p. 50, map 32). Known in all the southern coastal districts of Greenland,

northward in the west to about lat. 72°, and in the east to about 74°30′ (BHJ., p. 189; PORSILD, l. c., map 289; SEIDENFADEN & SØRENSEN, 1937, p. 177).

### *Pedicularis lapponica* L.

Common, or very locally abundant, in wet moss-sedge meadows, hummocky wet meadows, and in heath tundra on moist mountain slopes. It is occasionally found on turf hummocks, and in the relatively thin turf on the fronts and lower margins of small, inactive gelifluction lobes. On the latter sites it sometimes undergoes a certain amount of desiccation, but nowhere is this species found in soils as dry as those in which *P. hirsuta* and *P. flammea* will grow. Also, it was not seen in coverages of less density than 50%. The surficial soils of its sites appear to be relatively stable except for mass flowage and the periodic fracturing resulting from this.

Observations elsewhere in the fjord region are fairly consistent with those at Mesters Vig. GELTING (1934, p. 157) found the species rather rare in his area, and chiefly in the inner fjords, especially in moist *Betula-Vaccinium* heaths. SØRENSEN noted in 1933 (p. 107–8) that it was mostly in damp soil, nearly always in places in which raw humus would form. In 1937 (p. 136) he placed it in a single moderately moist ecosystem: Sheltered precipices and rock ledges. OOSTING found it only in "mature moss mats" (1948, p. 252–3).

Hemicryptophyte, with fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (PORSILD, Ill. Fl., p. 140; HULTÉN, Fl. Al., p. 1411). In Greenland it is known on the west coast from about lat. 61° to about 73°, and on the east coast between lats. 68°30′ and 74°30′ (BHJ., p. 186; PORSILD, l. c., map 291; SEIDENFADEN & SØRENSEN, 1937, p. 177).

### *Pedicularis flammea* L.

Common in wet moss-sedge meadows, hummocky wet meadows, on turf hummocks, and in heath tundra on moist mountain slopes. It is also found in silty or sandy soils kept moist during the summer by water from melting snow or thawing ground. On these soils it is apparently able to withstand a great deal of desiccation, for it is found surviving on nearly barren silts that are dry and hard at the surface in summer. On the coverage gradient it grows in vegetations ranging from 6% to 90% of coverage. In the damp sands and silts it probably undergoes a good deal of frost heaving in autumn, but its most disturbed sites are on small, active silt gelifluction lobes.

Earlier observers in the fjord region make no mention of the capacity of this species to withstand desiccation. GELTING, (1934, p. 155–6) found it only in damp to moderately damp soil. SØRENSEN in 1933 (p. 105–6) noted it as most frequent in damp grassy places, and in 1937 (p. 114) placed it only in moderately moist or moist to wet ecosystems. OOSTING saw it only in "mature moss mats" (1948, p. 252–3).

Hemicryptophyte, with short vertical rhizome and fleshly adventitious roots (GELTING, 1934, p. 155–6, 294).

Geographic distribution: Amphi-Atlantic, with extensions westward to Great Bear Lake and eastward to Iceland and Norway (HULTÉN, Amph. Pl., p. 182, map 163; PORSILD, Ill. Fl., p. 141). It is known in all the southern coastal districts of Greenland, extending northward in the west to about lat. 76°, and in the east to about 77°40′ (BHJ., p. 186; PORSILD, l. c., map 294; SEIDENFADEN & SØRENSEN, 1937, p. 177).

### ***Pedicularis hirsuta*** L.

Common in the Mesters Vig district, but always occurring as scattered individual plants. It grows in several kinds of sites that show a wide range on the moisture gradient, from hummocky wet meadows and heath tundra on moist mountain slopes, to stony-gravelly talus slopes that are extremely dry in summer. On these gravelly slopes it is in open vegetation, in coverages of 6–10%, while in the organic turf of heath tundra it may be in coverages of 81–90%. Intermediate moisture and coverage conditions under which it grows are found on sandy slopes kept moist during the summer by water from melting snow and thawing ground. The surficial soils in most of its sites are fairly stable, though it shows notable capacity to survive physical disturbance. In damp sandy soils it probably undergoes a good deal of frost heaving, particularly in autumn. Also it was found living in the actively moving surficial soils on the tops of large till gelifluction lobes. On the tops of the ancient delta remnants it was found in an area of actively depositing sand, apparently withstanding the rigors of sand-blast and partial burial. It appears as a weed in the disturbed soils around habitations.

The wide range of tolerance shown by this species in the moisture and coverage scales has been noted by other observers, though its corresponding tolerance in the disturbance gradient has largely gone unnoticed. GELTING (1934, p. 156–7) remarked that it had a greater amplitude in the moisture scale than *P. flammea* or *P. lapponica*, and that it appeared in a large number of plant associations, on damp as well as on dry soil. SØRENSEN (1933, p. 106–7) stated that it grew in any kind of soil except the driest. In 1937 (p. 114) he listed it in four

ecosystems ranging from the driest (Barren ground) through one in the moderately moist series, to two in the moist to wet series.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Amphi-Atlantic, with extensions westward into the Canadian Arctic Archipelago and the District of Mackenzie, and eastward in northern Eurasia to the region of the New Siberian Islands (HULTÉN, Amph. Pl., p. 28, map 9; PORSILD, Ill. Fl., p. 142). In Greenland it is a northern species, known in all the northern coastal districts, southward in the west to about lat. 62°30′, and in the east to about 65°30′ (BHJ., p. 187; PORSILD, l. c., map 297).

### *Pinguicula vulgaris* L.

Not found in the Tunnelelv drainage or on the Nyhavn and Labben peninsulas, but collected in the vicinity of Ekspeditionshus in Mesters Vig (bay) by GUDMUNDSSON and BJÖRNSSON (Herb. H. R.).

This species has been seen but rarely in the fjord region, and habitat notes on it are scanty. SØRENSEN in 1933 (p. 102–3) reported what was known about a collection locality near the head of Franz Josephs Fjord, where the plants were growing on a boggy tableland some sixty feet above the beach, in moist ground. In 1937 (p. 137) he placed the species in a moderately moist ecosystem: Herb mats on sheltered sunny slopes.

Hemicryptophyte (BÖCHER, 1938, p. 179), with fibrous adventitious roots.

Geographic distribution: Circumpolar but apparently with large discontinuities in its range, particularly in Asia (HULTÉN, Amph. Pl., p. 230, map 211; cf. also PORSILD, Ill. Fl., p. 142). In Greenland it is known in the southerly coastal districts, northward in the west to about lat. 71°30′, and in the east to about 73°10′ (BHJ., p. 190; PORSILD, l. c., map 299; SEIDENFADEN & SØRENSEN, 1937, p. 176, 189, fig. 53).

### *Campanula uniflora* L.

Common in heath tundra on moist mountain slopes and damp ledges, usually in relatively dense vascular plant coverages (70–90 %). The surficial soils in most of these sites are relatively stable except for mass flowage in some cases. The species was found, however, growing in apparently active sandy and shaly debris islands on the summit of Hesteskoen, in a coverage density of 5 % or less. Thus it seems capable of surviving considerable disturbance to its root systems.

GELTING (1934, p. 131–2) noted a wider amplitude in the moisture scale for this species than he saw in *C. rotundifolia*. However, he did

not go into detail on this. SØRENSEN in 1933 (p. 89) gave its habitat as dry sunny slopes among grass, and in 1937 (p. 114) he listed it in a single ecosystem, Sunny slopes, in the dry series. When these observations are added to those at Mesters Vig, *C. uniflora* appears to have a considerably wider tolerance in the moisture gradient than it shows in the latter place, and corroborates GELTING's observation of 1934, at least in part.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Amphi-Atlantic, ranging westward to eastern Asia, and eastward to Novaya Zemlya (HULTÉN, Amph. Pl., p. 192, map 173; PORSILD, Ill. Fl., p. 143). In Greenland it is known on the east coast between lats. 65°37′ and 77°37′, and on nearly all of the west coast north to about lat. 79° (BHJ., p. 196; PORSILD, l. c., map 302; GRÖNTVED, Fl. Icel., p. 358).

### ***Campanula rotundifolia*** L.

Occasional or locally common in the Mesters Vig district, in habitats ranging from moist to comparatively dry. It grows on ledgy slopes, and on rather dry turfy ledges among the trap knobs where it is mixed with grasses, heaths, and the more xerophytic sedges. In these places it may be in coverages of 60 % to 90 %. It appears in more moist turf on foot slopes and at the bases of cliffs. On the tops of trap knobs and ridges, or on dry ledges it is sometimes found in loose stony grus, in very open coverage (11–20 %). Most of its sites appear to have relatively stable surficial soils, though on some of the steep ledgy slopes they are subject to creep.

GELTING (1934, p. 130–1) gave the habitat of this species merely as dry warm slopes with a southward exposure. SØRENSEN likewise said only that it grew on dry sunny slopes (1933, p. 88–9; 1937, p. 136). OOSTING (1948, p. 255–6, 259–60) noted it on ledges and in sandy pockets among barren rocky hills, and he also included it in his *Dryas*-sedge "preclimax" vegetation on dry soils. None of these observations suggests the wider tolerance in the moisture gradient shown by the species at Mesters Vig.

Hemicryptophyte, with taproot (GELTING, 1934, p. 293).

Geographic distribution: Circumpolar, with large discontinuities in its range (PORSILD, Ill. Fl., p. 143–44; HULTÉN, Fl. Al., p. 1462–3). Known in all the southerly coastal districts of Greenland, extending northward in the west to about lat. 75°, and in the east to about 74°30′ (BHJ., p. 195–6; PORSILD, l. c., map 303; SEIDENFADEN & SØRENSEN, 1937, p. 175).

### ***Erigeron uniflorus*** L. ssp. ***eriocephalus*** (J. VAHL) CRONQUIST

*Erigeron eriocephalus* J. VAHL

Not found in the Tunnelelv drainage or on the Nyhavn and Labben peninsulas, but collected in the vicinity of Ekspeditionshus by GUDMUNDSSON and BJÖRNSSON (Herb. H. R.) in Mesters Vig (bay).

GELTING found this species rather rare in the central part of the fjord region (1934, p. 136–7). He noted it exclusively on dry soil, sometimes in closed plant associations, but generally on bare sandy or gravelly soil. SØRENSEN (1937, p. 114) placed it in a single dry ecosystem: Sunny slopes.

Hemicryptophyte, with many fibrous adventitious roots (GELTING, 1934, p. 294).

Geographic distribution: Circumpolar (HULTÉN, Amph. Pl., p. 194). In Greenland it is apparently a northern species, extending around the northern coast and southward in the west to about lat. 66°. On the east coast it is known between lat. 74°46′ and Scoresby Sund, and then in an isolated locality at about lat. 63°07′ (BHJ., p. 199; PORSILD, Ill. Fl., map 307; GRÖNTVED, Fl. Icel., p. 363–64).

### ***Erigeron humilis*** GRAHAM

*Erigeron unalaschkensis* (DC.) VIERH.

Common in heath tundra on moist mountain slopes, on turf hummocks, on the turfy fronts of large till gelifluction lobes, and especially in sandy or silty soil kept moist during the summer by water from melting snow or thawing ground. However, it grows also in some sandy soils that become relatively dry in summer, on stony till knolls, and on south-facing ledgy slopes. In these habitats, taken together, it occupies vascular plant coverages ranging from 6 % to 90 %, and is relatively common in all of them. Its capacity to survive disturbance is shown by its presence in small stony water courses in the mountains, where spring flooding is intense. In the damp sandy and silty soils it probably undergoes rather severe frost heaving in autumn. Many of its organic soil habitats are subject to mass flowage and fracture, especially on the fronts of gelifluction lobes.

Observations elsewhere in the fjord region, taken together, corroborate fairly well those made at Mesters Vig on the habitat of this species so far as the moisture and coverage gradients are concerned. SØRENSEN (1933, p. 91–2) noted it in damp sunny places, and in 1937 (p. 114) he listed it in a single, moist to wet ecosystem: Sheltered sunny slopes and patches. GELTING, on the other hand (1934, p. 135–6), called it a

typical snow-patch plant, growing mainly in patches that dry up early in summer. Oosting (1948, p. 252) found it on the damp clayey margins of drainage ways.

Hemicryptophyte, with fibrous adventitious roots (Gelting, 1934, p. 294).

Geographic distribution: Regarded by Cronquist (1947, p. 237–9) as circumpolar (cf. also Porsild, Ill. Fl., p. 146). Hultén, apparently in doubt as to the identity of some Asiatic material, has preferred to consider it amphi-Atlantic (Amph. Pl., p. 194, map 175). In Greenland the species is known in all the southerly coastal districts except the southernmost. On the west coast it extends from about lat. 62°40′ to about 75°, while on the east it reaches from about 61° to about 76°46′ (BHJ., p. 199–200; Porsild, l. c., map 309; Gröntved, Fl. Icel., p. 364; Böcher, 1954, p. 115, fig. 29).

### ***Antennaria canescens*** (Lge.) Malte

*Antennaria alpina* (L.) Gaertn. of authors, in part.

Occasional on rather dry turfy ledges where the soils are sandy and relatively stable. Where found it was in vascular plant cover of 31–40 %. Also seen in similar situations on the lateral fronts of large till gelifluction lobes.

Observations on this species made in the fjord region by Sørensen and Gelting were not separated from those on *A. Porsildii*. The two species are closely related, and their habitat relationships appear to be nearly the same.

Chamaephyte, with fibrous adventitious roots (Gelting, 1934, p. 290).

Geographic distribution: Endemic to eastern subarctic North America (Porsild, Ill. Fl., p. 147, map 310). Known in all the southerly coastal districts of Greenland, northward in the west to about lat. 73°, and in the east to about 74°30′ (Porsild, l. c.; BHJ., p. 202).

### ***Antennaria Porsildii*** E. Ekman

*Antennaria alpina* (L.) Gaertn. of authors, in part.

Occasional to common on relatively dry ledges and sandy slopes. It is most frequent on south-facing ledgy slopes and river bluffs, among heaths and xerophytic grasses and sedges, usually in fairly loose vegetative cover (21–30 %). The surficial soils in these sites are stable in most places, but in some they are subject to creep, for they lie at steep angles and are scarcely at rest.

Gelting (1934, p. 132–33) noted the habitat of this species as warm sandy slopes facing south, and Sørensen (1933, p. 89–90) found it on sunny slopes with a herbaceous vegetation. In 1937 (p. 137) Sørensen listed it in one moderately moist ecosystem: Herb mats on sheltered

sunny slopes, which probably enlarges its range in the moisture gradient a little beyond that observed at Mesters Vig.

Chamaephyte with fibrous adventitious roots (GELTING, 1934, p. 290).

Geographic distribution: Amphi-Atlantic, with areas only in Greenland and Norway (HULTÉN, Amph. Pl., p. 184, map 165). In Greenland it is known on the west coast from Disko north to about lat. 72°30′ and near the southern tip. On the east coast it has been found in the region of Angmagssalik, and then between lat. 69°05′ and Clavering Ø (ca. lat. 74°10′) (HULTÉN, l. c.; BHJ., p. 202–03).

### ***Matricaria ambigua*** (LEDEB.) KRYL.

*Matricaria inodora* L. var. *grandiflora* (HOOK.) OSTF.

Found only once in the Mesters Vig area, growing profusely around a small house used by hunters in winter, on a sandy beach near the entrance to Mesters Vig (bay). It was forming dense mats on sand kept damp by a small stream from melting snow drifts in the neighboring hills. However, the species was also growing on relatively dry sand nearby.

Both GELTING (1934, p. 137–9) and SØRENSEN (1933, p. 92–3) noted this species particularly on the sites of old Eskimo habitations. They also recorded it on sandy seashores, SØRENSEN remarking that it was growing on old seaweed behind raised beaches. In 1937 (p. 186) SØRENSEN placed it in only one ecosystem: Seashore lagoons.

Hemicryptophyte, with taproot, and later developing fibrous adventitious roots (GELTING, 1934, p. 137–39, 293).

Geographic distribution: Nearly circumpolar (PORSILD, Ill. Fl., p. 148–9; cf. also HULTÉN, Fl. Al., p. 1544–5; POLUNIN, Circ. Fl., p. 449). In Greenland it is known only on the northeast coast, between Mesters Vig (lat. ca. 72°10′) and Clavering Ø (lat. 74°10′) (BHJ., p. 205; PORSILD, l. c., map 315).

### ***Arnica alpina*** (L.) OLIN

Common in relatively dry sandy soils, on till slopes and knolls, on southfacing ledges among the trap and sandstone ridges, and on steep river bluffs. It is abundant on the lower and lateral fronts of large till gelifluction lobes, on some of which it grows on moist sites. It is found in vascular plant coverages ranging from 11 % to 70 %. The surficial soils in most of its habitats are fairly stable, though on the steep slopes they are subject to creep.

Earlier observers have emphasized the dryness of the sites in which this species grows, with no mention of its range into the moister parts of the water gradient. GELTING (1934, p. 132–4) found it in dry grass heaths and on bare sand, and SØRENSEN noted it mostly on dry sunny

slopes (1933, p. 91; 1937, p. 114). OOSTING saw it on more or less open sandy slopes (1948, p. 259).

Hemicryptophyte, with oblique rhizone and fibrous adventitious roots (GELTING, 1934, p. 133–4, 294).

Geographic distribution: *Arnica alpina* is part of a circumpolar complex in which several closely related subspecies have been recognized. HULTÉN (Amph. Pl., p. 202, maps 183, 184) largely following MAGUIRE (1943), has identified the Greenland and Spitzbergen plants with ssp. *angustifolia* of boreal America. JØRGENSEN, SØRENSEN & WESTERGAARD (1958, p. 104), on the other hand, maintain that much Greenland material is very close to typical *A. alpina* of northern Scandinavia, and cannot be distinguished from it. If *A. alpina*, sens. str., is grouped with all the American subspecies (*angustifolia*, *attenuata*, *tomentosa*, and *Sornborgeri*), the whole constitutes an amphi-Atlantic complex with its main area in America. Separated from this are two Asiatic subspecies (*Iljinii* and *intermedia*). In Greenland the species ranges approximately between lats. 66°07′ and 77°47′ on the eastern coast, and from about lat. 64° to about lat. 78° on the western coast (BHJ., p. 206; PORSILD, Ill. Fl., map 323; SEIDENFADEN & SØRENSEN, 1937, p. 69, 175).

### *Taraxacum phymatocarpum* J. VAHL

Apparently rare in the Mesters Vig district, and found only on the summit of Hesteskoen. There it was growing in open cover (1–5 %), in both disturbed and relatively stable surficial soils. It was most common on ledges, but was also found in the centers of apparently quite active sandy and shaly debris islands.

The collections and observations of this species at Mesters Vig, though scanty, suggest a wide tolerance in the disturbance gradient, and this is borne out by notes made elsewhere in the fjord region. GELTING (1934, p. 143–4) merely recorded it in bare, dry, sandy soil, and remarked that it did not occur in snow-patches. SØRENSEN (1933, p. 94–5) found it in dry places exposed to the wind, and also where there was solifluction. In 1937 (p. 114) he listed it in one dry ecosystem: Clayey flats and raised beaches; and in one moist to wet one: Solifluction clay. Thus he at once gave it wide tolerances in both moisture and disturbance gradients.

Hemicryptophyte, with taproot (GELTING, 1934, p. 295).

Geographic distribution: Mainly confined to arctic America and Greenland (HULTÉN, Fl. Al., p. 1604; Amph. Pl., p. 80; POLUNIN, Circ. Fl., p. 467). FERNALD (1933, p. 373) added arctic eastern Asia to its range, and PORSILD (Ill. Fl., p. 155) noted it as occurring in "Arctic Eurasia." It is known in all the northerly coastal districts of Greenland,

southward in the west to Disko, and in the east to Scoresby Sund (BHJ., p. 217; PORSILD, l. c., map 331).

### *Taraxacum arcticum* (TRAUTV.) DAHLST.

Occasional or locally common, in habitats that are usually moist and have relatively low vascular plant coverages (1–20 %). However, there are so many exceptions to this that the species shows wide tolerances on the moisture and coverage gradients. It grows on turf hummocks, and in the dense coverages of heath tundra on moist mountain slopes. Intermediate coverages and moisture regimes in which it is found are on the lateral and lower fronts of large till gelifluction lobes. It also grows in sandy and silty soils kept moist during the summer by water from melting snow and thawing ground. On the clayey silt loams bordering the fjord it survives intense desiccation during the summer, for these silts dry to brittle hardness at the surface. Its organic soil sites are relatively stable except for mass flowage in some cases, but on the damp sands and silts it probably undergoes a good deal of frost heaving in autumn. On the summit of Hesteskoen it was growing in apparently active debris islands developed in sandstone and shale, and on the upper north slopes of Hesteskoen it was living in actively moving soils on the tops of large till gelifluction lobes.

Earlier observations on the habitat of this species in the fjord region do not do it justice. GELTING (1934, p. 139–40) thought it preferred organic to mineral soils, and noted that it was scarce in snow-patches. He said it was especially frequent in moderately damp mossy grass meadows around old Eskimo sites, but was not restricted to these old sites. SØRENSEN in 1933 (p. 93–4) merely stated that it was most frequent in not too wet sites. In 1937 (p. 114) he listed it in a single, moist to wet ecosystem: Sheltered sunny slopes and patches.

Hemicryptophyte, with taproot (GELTING, 1934, p. 295).

Geographic distribution: Regarded as amphi-Atlantic by HULTÉN (Amph. Pl., p. 80, map 62), with its main range in arctic Asia from Novaya Zemlya to Bering Strait, and with its western limits in Greenland. Known on the north coast of Greenland, and on the east coast southward to Scoresby Sund (BHJ., p. 217).

### *Taraxacum brachyceras* DAHLST.

*Taraxacum croceum* DAHLST. ssp. *brachyceras* (DAHLST.) GELTING

Locally common on moist to relatively dry turfy slopes, in coverages ranging from 20 % to 90 %. It is most frequent on steep banks among grasses, sedges and heaths, such as occur on river bluffs, on the

fronts and lower lateral margins of large gelifluction lobes, or the fronts of debris slides resulting from earth flow. Some of the slopes are relatively stable, while others are subject to mass flowage, and to fracture and fall of the turf.

Observations of this species by others, elsewhere in the fjord region, when taken together are consistent with those made at Mesters Vig. GELTING (1934, p. 141–43) saw it on slopes with south exposure, on dry soil associated with what he considered typical snow-patch plants: *Carex Lachenalii*, *Draba crassifolia*, *Erigeron humilis* (*unalaschkensis*), and *Potentilla Crantzii*. SØRENSEN (1933, p. 94) noted it on sunny slopes with a herbaceous vegetation, and repeated this in 1937 (p. 137) when he placed it in a single moderately moist ecosystem: Herb mats on sheltered sunny slopes.

Hemicryptophyte, with taproot (GELTING, 1934, p. 295).

Geographic distribution: Mesters Vig specimens in this section of *Taraxacum* are determined as *T. brachyceras* somewhat tentatively, though they match many others collected in the fjord region of Northeast Greenland that have been so named. *Taraxacum brachyceras* is considered by JØRGENSEN, SØRENSEN & WESTERGAARD (1958, p. 106) as one of several microspecies in the section *Crocea* that are known to occur in Greenland. According to BHJ. (p. 218), it is restricted to the eastern coast between lats. 68°10′ and 74°10′ except for a reported occurrence near the southern tip. All the other microspecies are more southern with the exception of *T. devians* DAHLST. which extends northward to Scoresby Sund. *Taraxacum brachyceras* is said to occur in Europe but not in America (SEIDENFADEN & SØRENSEN, 1937, p. 175), thus suggesting an amphi-Atlantic distribution. HULTÉN (Amph. Pl., p. 34, map 16) has considered the collective species, *T. croceum*, as amphi-Atlantic, with extensions westward to Baffin Island, Hudson Bay and the Gulf of St. Lawrence, and eastward to Scandinavia and the lower Obi River. He does not list the microspecies content of his map, but he mentions the fact that about 40 have been described, and it is presumed that he used all of them.

# ADDENDA

Additional field work was done in the Mesters Vig district in the summer of 1964 (July 17 to Sept. 1). Vascular plant collections totaled only 94 field numbers, but these yielded three species that had not previously been found in the district. A fourth species, *Carex bicolor*, noted in the preceding list as not seen in the Mesters Vig study area but collected by GUDMUNDSSON and BJÖRNSSON near Ekspeditionshus, was found at an altitude of about 200 m on the lower northwest slopes of Domkirken, and among kames near the east bank of Tunnelelv at about 90 m. Habitat notes given in the preceding list for this species are not materially altered by the 1964 observations. The three additions to the known vascular flora are as follows.

### *Carex macloviana* D'URV.

This species was found in only one locality in the Mesters Vig district. It was growing on a steep southeast-facing slope in stony-sandy soil at an altitude of about 200 m near Rungsted Elv, on the lower northwest slope of Domkirken (no. 794). Where found it was abundant in association with *Juncus trifidus*, *Cassiope tetragona*, *Festuca brachyphylla*, and *Salix arctica*. *Salix glauca* was also collected in this vicinity. I have seen no other record of it north of Scoresby Sund (cf. BÖCHER, 1938, p. 226–227, Fig. 121). In the latter region it was noted as growing "in luxuriant herb-field".

Noted as a geophyte by BÖCHER (1938, p. 227), but the species is densely caespitose, and behaves like a hemicryptophyte with fibrous roots.

Geographic distribution: Amphi-Atlantic, ranging eastward to Iceland and the northern Scandinavian mountains, and westward to the lower Arctic of eastern Canada (HULTÉN, Amph. Pl., p. 204, map 185). Closely related if not identical forms appear in northwestern America (ssp. *pachystachya*), in Kamchatka, Hawaii, and in South America. In Greenland it is rather widely dispersed on the west coast north to about lat. 71°45′, and apparently more scattered on the east coast north to Mesters Vig (cf. BÖCHER, l. c.; BHJ., p. 225).

### *Salix glauca* L.

Apparently rare in the Mesters Vig district, where it was seen by our field parties in a single locality. This was on the lower northwest slope of Domkirken, on steep valley slopes near Rungsted Elv, at an altitude of about 200 m. It was growing in stony and sandy soils on southwest- and southeast-facing slopes. The shrubs had ascending branches, and were up to 30 cm high (nos. 787, 796). Not enough information is available to do more than express the opinion that *S. glauca* in this district probably has narrow tolerances on the environmental gradients of moisture, disturbance and coverage. It is variable in form. The leaves of no. 787, particularly those on the peduncles, are short and broad, scarcely more than 1.5–2.5 times longer than broad, thus suggesting the eastern American forms of *S. glauca* which have long been called *S. cordifolia* PURSH. (*S. glauca* ssp. *callicarpaea* (TRAUTV.) BÖCH.; cf. BHJ., p. 139). The leaves of no. 796, however, are much longer relative to their breadth, and resemble those of more typical *S. glauca.*

Earlier notes on the habitat and frequency of *S. glauca* in the fjord region are essentially non-existant. According to BÖCHER, HOLMEN and JAKOBSEN (1957, p. 139) its northernmost habitats on the east coast are in "CEm" and "NEs". Neither of these areas include Kong Oscars Fjord, though most of the Scoresby Sund area, and the coastal district between it and Kong Oscars Fjord are included. Their general notes on habitat for the ssp. *callicarpaea* (the only one thought by BHJ. to occur so far north) are copses, dwarf-shrub heaths, fellfields, herb slopes and along stream banks. The species is said to be generally "frequent".

Nanophanerophyte (BÖCHER, 1938, p. 66).

Geographic distribution: *Salix glauca*, s. l., is a highly variable circumpolar species complex composed of several geographically more or less segregated races (PORSILD, Ill. Fl., p. 68–9, maps 121, 122; HULTÉN, Fl. Al., p. 525–32; BÖCHER 1938, p. 66; RAUP, 1959, p. 53–62; ARGUS 1961, p. 78–9). In Greenland it is southern in general range, extending north on the west coast at least to Disko and probably farther. BHJ. (p. 139) give its northwestern limits in "NW", but are not specific as to latitude. It is presumed that the Mesters Vig locality noted here is at or near the northern limit of the species on the eastern coast.

### *Erigeron compositus* PURSC

We have a single collection of this species from the Mesters Vig district (no. 740). A small colony of it was found in 1964 at the lower margin of a sand and gravel terrace on the Nyhavn peninsula a short distance northwest of the Mesters Vig airfield. The plants were in dry,

nearly barren sandy soil, on a moderate slope, but near the borders of mats composed of *Dryas* and *Cassiope*. They were in full flower July 20.

SØRENSEN (1933, p. 91) listed only two localities for this species in the southern part of the fjord region, one on Ella Ø and the other on the south shore of Sofia Sund near the outer coast. GELTING (1934, p. 134–5) remarked that in the central part of the region it was "A rather rare species . . . mostly occurs in small numbers only". He noted further that it was abundant on soil rich in lime, and was frequently found below bird-stones. He called it "a decided xerophyte", and said that it was able to withstand the most violent winds. SØRENSEN (1937, p. 114) placed it in two ecosystems, both in the dry series: Barren ground, and Disintegrating summits and crests.

These notes suggest that the species is characteristic of the drier part of the moisture gradient, and is usually in rather open vegetative cover. The data give very little information about substrata, but the suggestion is that the soils in which the plants were observed were fairly stable.

Chamaephyte, with taproot (GELTING, 1934, p. 291).

Geographic distribution: A North American species, extending from Greenland through the northern and western part of the Canadian Arctic Archipelago, and southward in Western arctic Canada and the Cordillera (PORSILD. Ill. Fl., p. 146, map 306; CRONQUIST, 1947, p. 242–5). According to PORSILD's map (l. c.) the species has a wide, but somewhat broken range on the Greenland coasts. It is known on the north and northwest, and on the west from 72°0′ down to about 65°0′. Then there are stations at about 63°30′ on the southwest coast, and near the southern tip. On the east coast it is known from about lat. 77°0′ to Scoresby Sund, with isolated areas about lat. 68°0′ and 62°0′ (cf. also BHJ., p. 198–9; SEIDENFADEN & SØRENSEN, 1937, p. 194, fig. 56).

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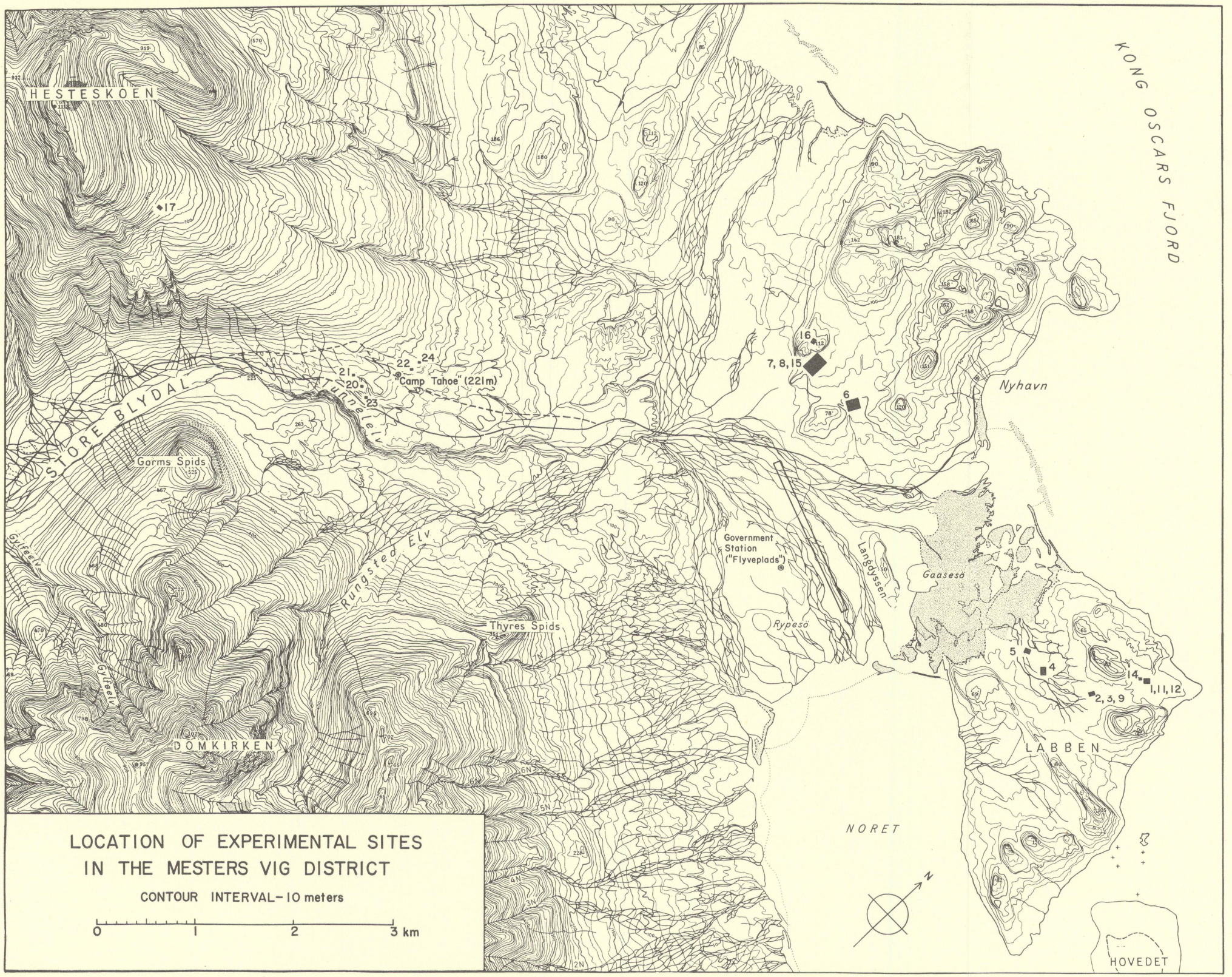
Færdig fra trykkeriet den 31. december 1965.




Map of Mesters Vig district, showing location of experimental sites.